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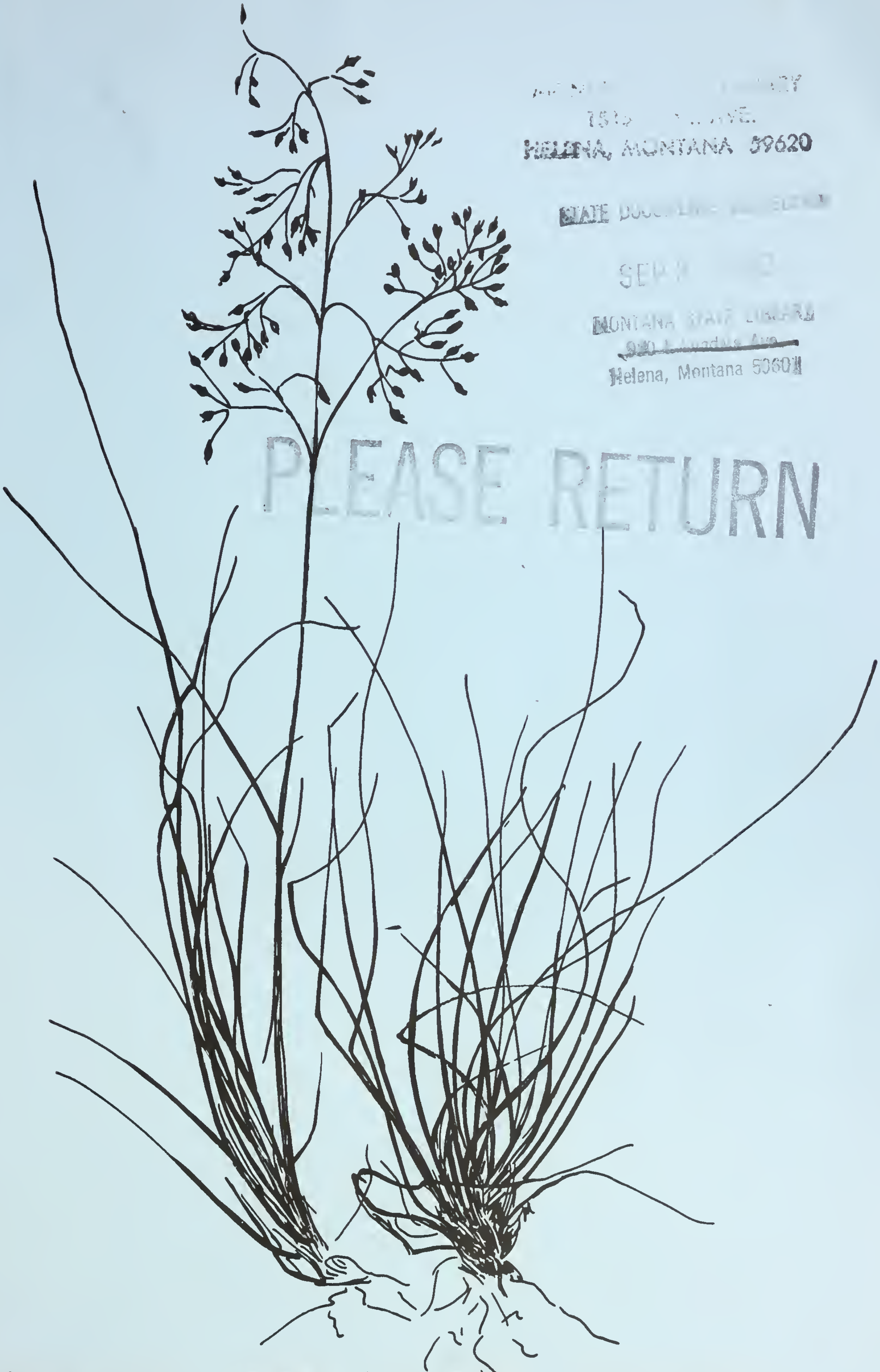

WEST DECKER MINE

Big Horn County, Montana

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Environmental Impact Statement

on the

PROPOSED MINING and RECLAMATION PLAN

for the

WEST DECKER MINE

EXTENSION

Big Horn County, Montana

Prepared by the Montana Department of State Lands
Pursuant to the Montana Environmental Policy Act
January 1980

Leo Berry Jr., Commissioner
Montana Department of State Lands

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SUMMARY
WEST DECKER PROPOSAL

Draft Statement

1. Type of Action: Administrative

2. Brief Description of the Action:

Decker Coal Company has applied for a permit to extend their West Decker mine. The administrative action involved is the decision by State and Federal agencies to grant or deny a permit. An estimated 119.87 million tons of coal would be removed from an area of about 1,727 acres within the next 20 years. If the company is able to obtain Federal short-term leases from the Bureau of Land Management, an additional 23.7 million tons of coal could be recovered from approximately 250 acres.

3. Summary of Impacts:

a. Adverse impacts that could not be avoided

The decreased infiltration of water from the replaced soils into the spoils would be the primary unavoidable impact, causing the development of piping on teh regraded slopes. Secondary to this would be the long-term potential for the development of sodic soils conditions on the reclaimed surface. The stability of the reduced highwall and other slopes would be increased if the company were able to obtain short-term leases from the BLM, and were permitted to implement an alternate mine plan.

If the revegetation were affected by erosion or sodic conditions, productivity, canopy cover, and species diversity would be reduced. This would, in turn, affect postmining land uses- particularly wildlife habitat.

Because West Decker is an existing mine and does not plan to increase production, little or no additional impact is expected to social and economic conditions, community services, land use, transportation, recreation, cultural resources, or aesthetics. Economic and social impacts to the elderly and those on low or fixed incomes would continue. A decrease in impacts would occur if the proposed town of Spring Creek, in Big Horn County, were built.

Air quality at the minesite would deteriorate slightly, but Federal ambient air quality standards would not be exceeded. Commuter traffic from Sheridan to Decker would increase gaseous pollutant emissions along the highway, but it would not cause the Federal standards for those pollutant gases to be exceeded.

b. The Relationship Between the Short-term Uses of the Environment and the Maintenance and Enhancement of the Long-term Productvity

If the reduced highwall were unstable and sodium and salts were to accumulate at the soil surface, the long-term productivity of the highwall areas would be impaired. The instability could in turn distort the designed drainage patterns, with unknown consequences. If reclamation were not successful there would be a decrease in the production from as much as approximately 3,000 acres of rangeland.

The impacts to air quality at the minesite would occur during the period of active mining and would therefore be short term. If reclamation and revegetation are not successful, the fugitive dust emissions of over 3 tons/acres/year could continue indefinitely.

c. The Irreversible and Irretrievable Commitment of Resources

Gasoline comsumption for the life of the mine would be 126,000 gallons annually while diesel consumption would be 1,600,000 gallons annually. Industrial water consumption would be 544,000 gallons per day. Water and fuel used in the recovery of 119.87 million tons of coal would be unavailable for other uses. Any cultural resources undiscovered prior to or in the course of mining would be irretrievably lost.

If West Decker were unable to obtain the short-term leases from the BLM, as much as 38.6 million tons of coal would be left unmined. Once this coal is by-passed, it is unlikely that it would be mined at a later date.

4. Alternatives considered:

Alternatives available to State and Federal agencies include: (a) no action, approval as proposed; (b) deferring the action; (c) preventing further development by suspending operations, cancelling the lease, or aquiring the lease; and (d) rejecting the mine and reclamation plan or restricting development on the lease. Other options include developing selected areas now under lease, and, approving the proposed mine and reclamation plan after modification. The mining and reclamation plan would meet criteria set forth in the Surface Mining Control and Reclamation Act of 1977, and the Montana Strip and Underground Mine Reclamation Act of 1973, and other pertinent criteria. The Department of State Lands and the Office of Surface Mining may also add stipulations to permit approval which would minimize environmental impacts by imposing various technical alternatives. The major stipulation to be considered is a variation in the proposed design of the reduced highwall.

5. Comments have been requested from: (see Summary Attachment)

SUMMARY ATTACHMENT

Comments have been requested from the following organizations:

State and local agencies

Office of the Governor, Montana
Office of the Governor, Wyoming
Montana Agricultural and Experiment Station
Montana Bureau of Mines and Geology
Montana Department of Community Affairs
Montana Department of Fish, Wildlife, and Parks
Montana Department of Health and Environmental Sciences
Montana Department of Natural Resources and Conservation
Montana Department of Revenue
Montana Environmental Quality Council
Montana Historical Society
Board of County Commissioners, Big Horn County, Montana
Board of County Commissioners, Sheridan County, Wyoming
Mayor, City of Sheridan

Federal agencies

- U.S. Department of the Interior:
  - Bureau of Indian Affairs
  - Bureau of Land Management
  - Geological Survey
  - Office of Surface Mining
- U.S. Fish and Wildlife Service

Applicant

Decker Coal Company

Others

Burlington Northern Railroad
Environmental Information Center
Montana Coal Council
Northern Cheyenne Tribal Council
Northern Plains Resource Council
Old West Regional Commission
Powder River Basin Resource Council
Sheridan Chamber of Commerce
Tri-County Ranchers Association
Tongue River Water Users Association
Yellowstone-Tongue Areawide Planning Organization

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CHAPTER I

DESCRIPTION OF THE PROPOSED ACTION

A. INTRODUCTION AND BACKGROUND

Decker Coal Company has applied for a 5-year permit to continue operations at their West Decker mine, located in Big Horn County, north of Decker, Montana (figure I-1). Mining at West Decker is conducted using two draglines and the split bench method of operation. The subbituminous coal has been mined at a rate of 7 million tons per year (mty) from the Anderson and Dietz 1 and the Deitz 2 coal seams (the D-1) and used for electrical generation in the midwest.

Mining began at the company's west pit in August 1972 on one state and two federal leases covering all or parts of sections 8, 9 10, 15, 16, 17, 21, T 9 S, R 40 E. Currently, mining has disturbed the area as follows:

Existing disturbance	Acres
Mine level	1,077.26
Spoils banks & ramp roads	235.46
Associated	1,892.49
Total	3,205.21

The company proposes to increase their mining level disturbance by approximately 654 acres over the 5-year period and to recover 28.9 million tons of coal. By 1996, 119.87 million tons of coal would be recovered.

Under the present proposal, the production rate would remain the same. There would be no new employment, and no new facilities would be required.

Decker Coal Company has applied to the Bureau of Land Management (BLM) for the short-term lease of 440 acres in portions of sections 8, 9, 17, and 20 (figure I-2) which are underlain by Federal coal. When the company meets the prerequisites, they would apply for another 120-acre short-term lease in section 18. If Decker were to obtain these leases, mine-life would be extended to 2001 and an additional 38.6 million tons of coal would be recovered. If the company did not obtain these leases, 23.7 million tons of coal would be by-passed and 14.9 million tons would be unrecoverable within the existing lease areas.

The BLM has published a draft technical examination/environmental assessment (TE/EA) on the present lease application (August 1979). Of the 440 acres applied for, 160 acres would be strip mined and the remainder would be used for associated disturbances and buffer zones.

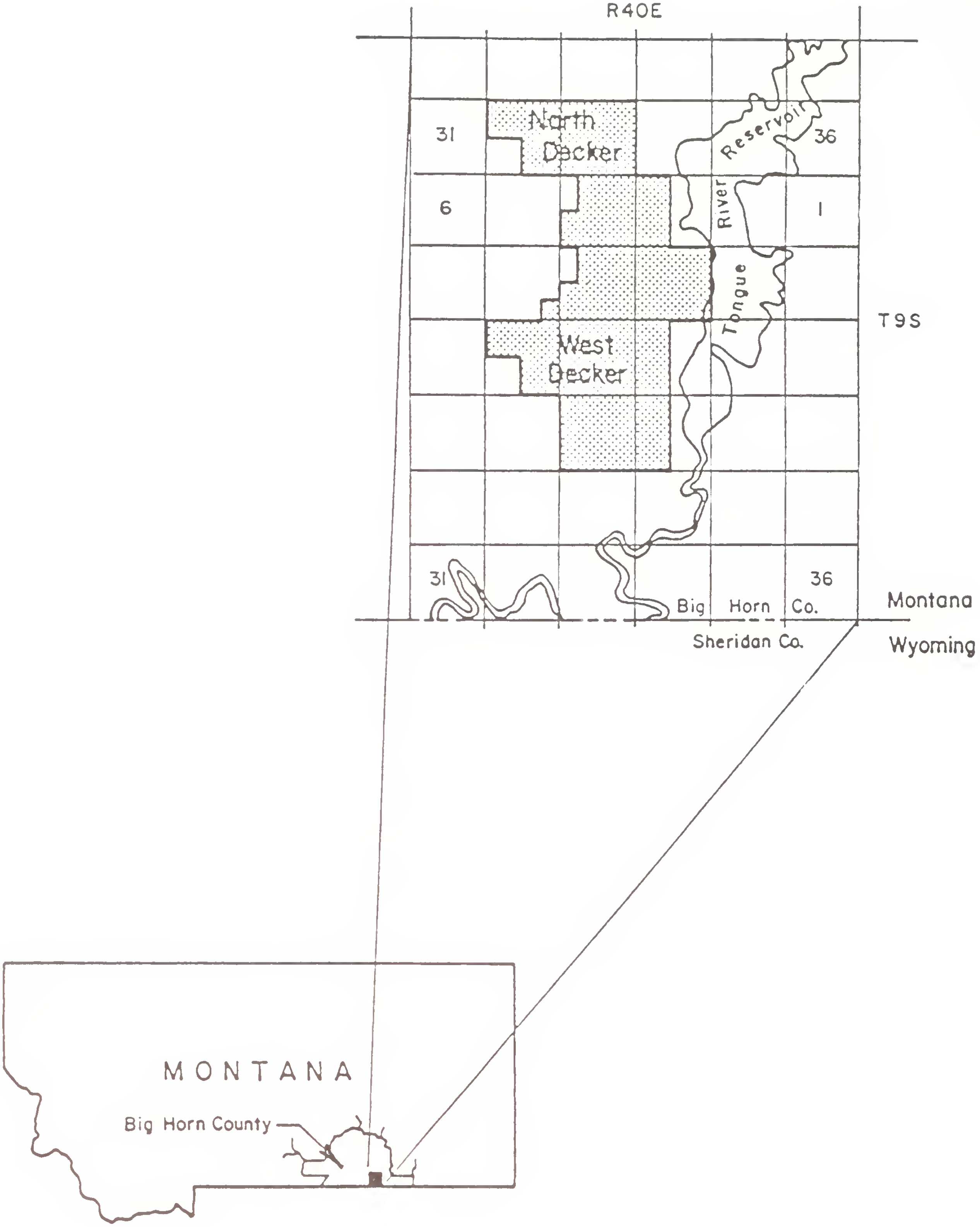
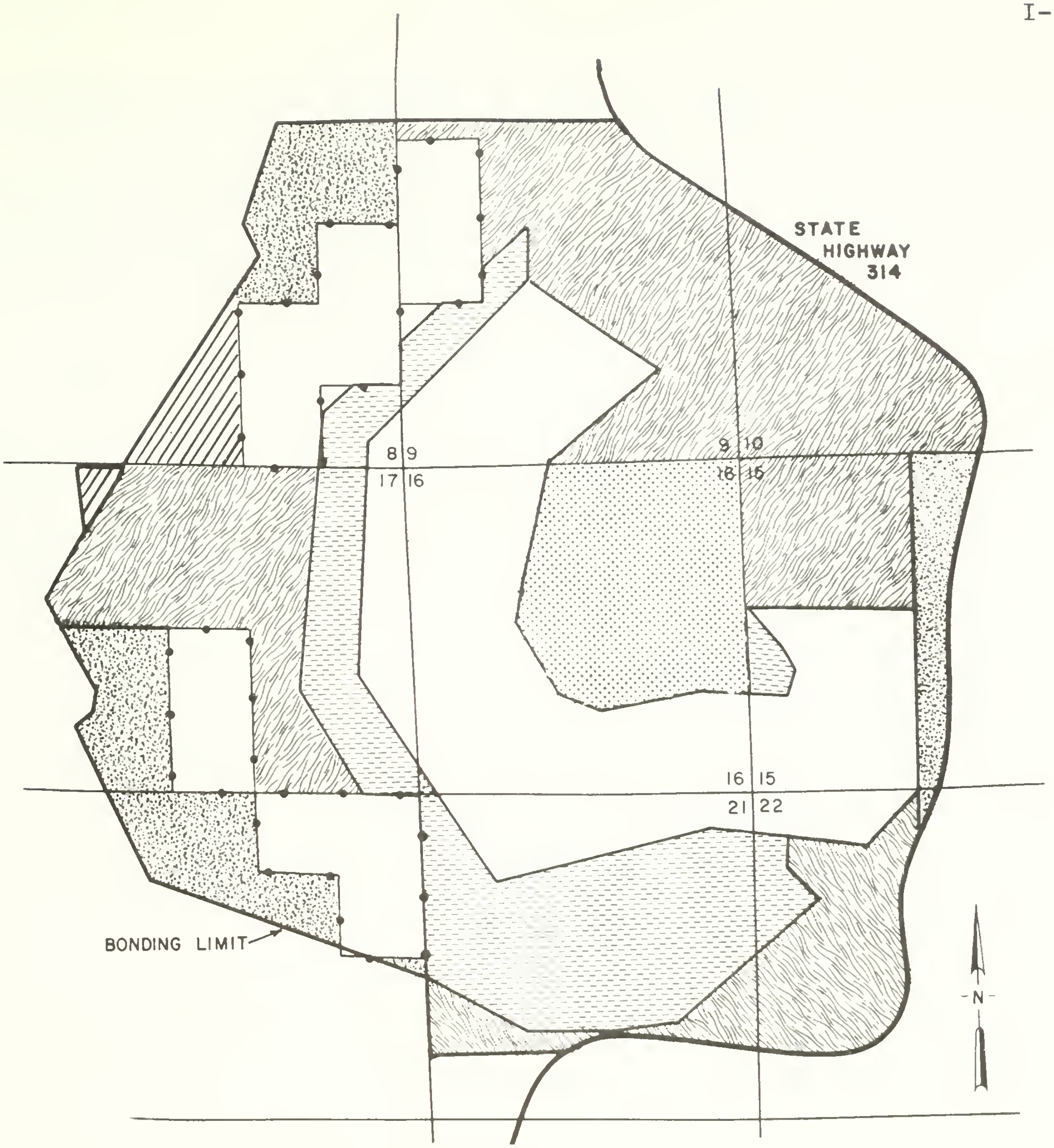


FIGURE I-1.--Location of the West Decker mine.



Federal leases- No. M-057934, M-057934A, and M-061685

▤ 5-year permit area ▨ mine life

▒ State lease No. 537.

☐ State and Federal lease already mined.

● Existing short-term lease application areas.

▨ Future short-term lease application area.

▒ Decker surface, no leases.

FIGURE I-2.--Coal leases in the Decker area.

As much of the baseline information pertaining to the Decker area was recently published in the Northern Powder River Basin Coal EIS (U.S. Department of the Interior (USDI) and the Montana Department of Sate Lands (MDSL), 1980) that document will be referenced throughout this environmental statement. Additional information in this chapter and in chapter II is based on recent materials submitted by Decker Coal Company to the Department of State Lands.

B. FEDERAL, STATE AND COUNTY ACTIONS

Several interrelated State, Federal, and county actions are involved in the approval or denial of applications for permits stemming from the company application. Decker Coal Company has many of these permits already, as indicated in table I-1, as the mine is an existing operation.

C. LEASE HISTORY

Mining operations began at West Decker in August 1972 on one state coal lease and two federal coal leases (figure I-2) in T 9 S, R 40 E. State coal lease No. 537, obtained in November 1963, is located in Section 16. Federal coal lease M-061685, obtained in March 1964, is located in Section 21, the W 1/2; in Section 17, excluding the SW 1/4; in Section 8 the SE 1/4 of the SE 1/4; in Section 9, the SW 1/4 and the E 1/2 of the W 1/2.

Federal coal lease M-057934A, obtained in October 1963, is located in Section 9, the SE 1/4 and the S 1/2 of the NE 1/4; in Section 10, excluding the N 1/2 of the N 1/2; in Section 15, the W 1/2; in Section 22, the W 1/2; and in Section 21, the E 1/2.

Decker has applied to lease 440 acres located in Section 8, the N 1/2 of the SE 1/4, the SW 1/4 of the SE 1/4, and the SE 1/4 of the NE 1/4; in Section 9, the W 1/2 of the NW 1/4; in Section 17, the E 1/2 of the SW 1/4; and in Section 20, the NW 1/4 of the NE 1/4 and the E 1/2 of the NE 1/4.

D. SITE LOCATION AND DESCRIPTION

The West Decker mine is approximately 25 miles northeast of Sheridan, Wyoming, and is situated to the west of the Tongue River Reservoir. Surface ownership is shown in figure I-3. State Highway 314 is located between the reservoir and the mine.

The West Decker mining operations (figure I-4) currently utilize a single pit with a horseshoe configuration progressing in a westerly direction. Mining began with the initial cut (box cut); the area from

TABLE I-1.--Permits required for the West Decker mine

Permit	Authorizing agency
*Surface mining and reclamation	Office of Surface Mining; U. S. Geological Survey; Montana Department of State Lands, Bureau of Land Management
*Rights-of-way for rail roads, powerline, and access road	Montana Department of Highways; Big Horn County, Montana; Wyoming Department of Environmental Quality; Bureau of Land Management, Montana Department of State Lands
*Solid Waste	Montana Department of Health and Environmental Sciences; Big Horn County, Montana
*Water Supplies	Montana Department of Health and Environmental Sciences; Montana Department of Natural Resources and Conservation
*Air quality emissions	Environmental Protection Agency, Montana Department of Health and Environmental Sciences
*Open Burning	Montana Department of Health and Environmental Sciences
Streambed construction and runoff retention	Army Corps of Engineers; Montana Department of Health and Environmental Sciences; Montana Department of Natural Resources and Conservation District; Montana Department of State Lands
Explosive manufacturing and storage	U. S. Treasury
Building construction and housing	Montana Department of Administration; Montana Department of Community Affairs; Montana Department of Health and Environmental Sciences; Big Horn County, Montana
High structures (radio tower and coal storage building)	Federal Aviation Administration
Radio transmission	Federal Communication Commission

*New or recent permits.

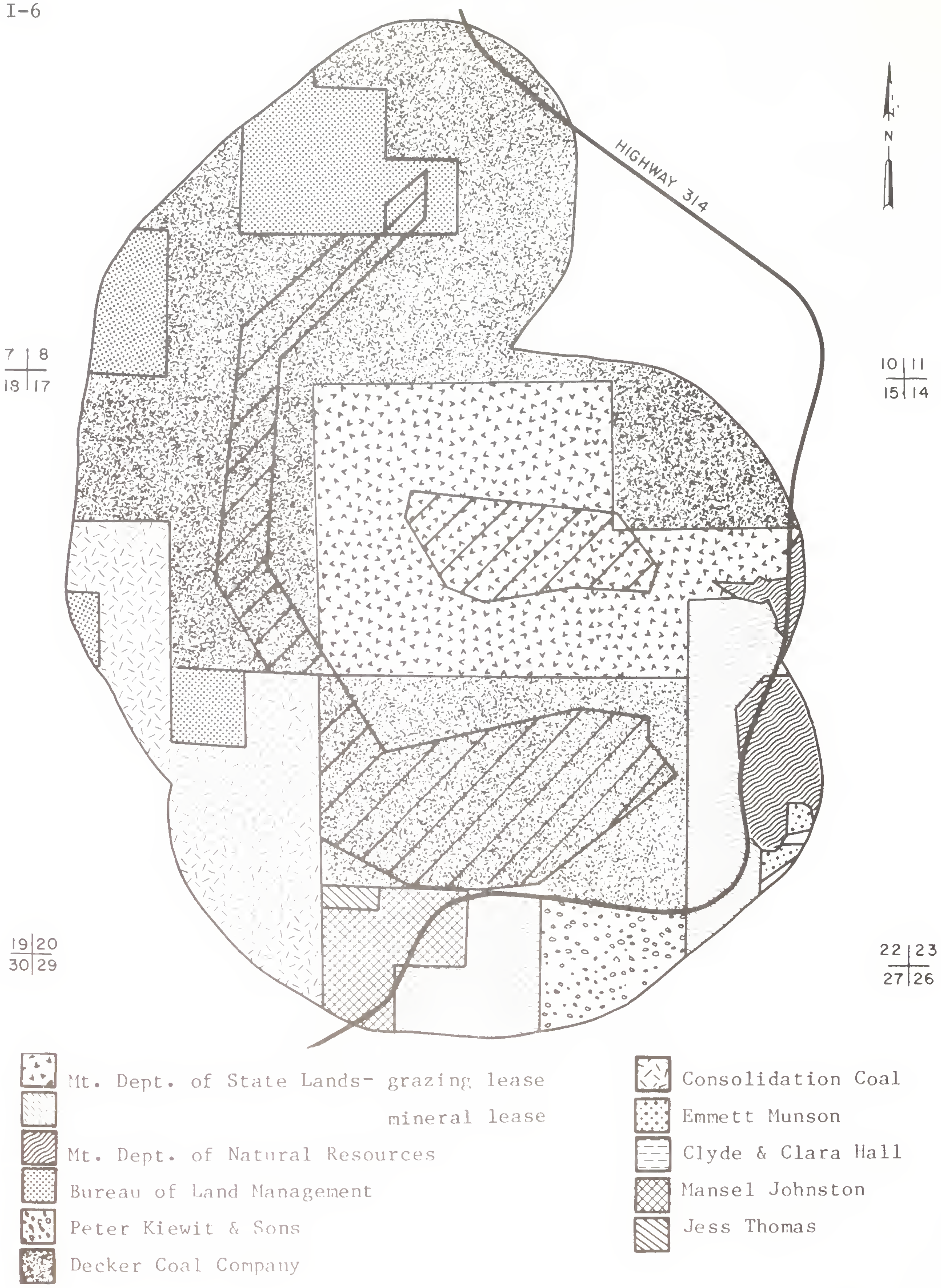


FIGURE I-3.--Surface ownership at West Decker.

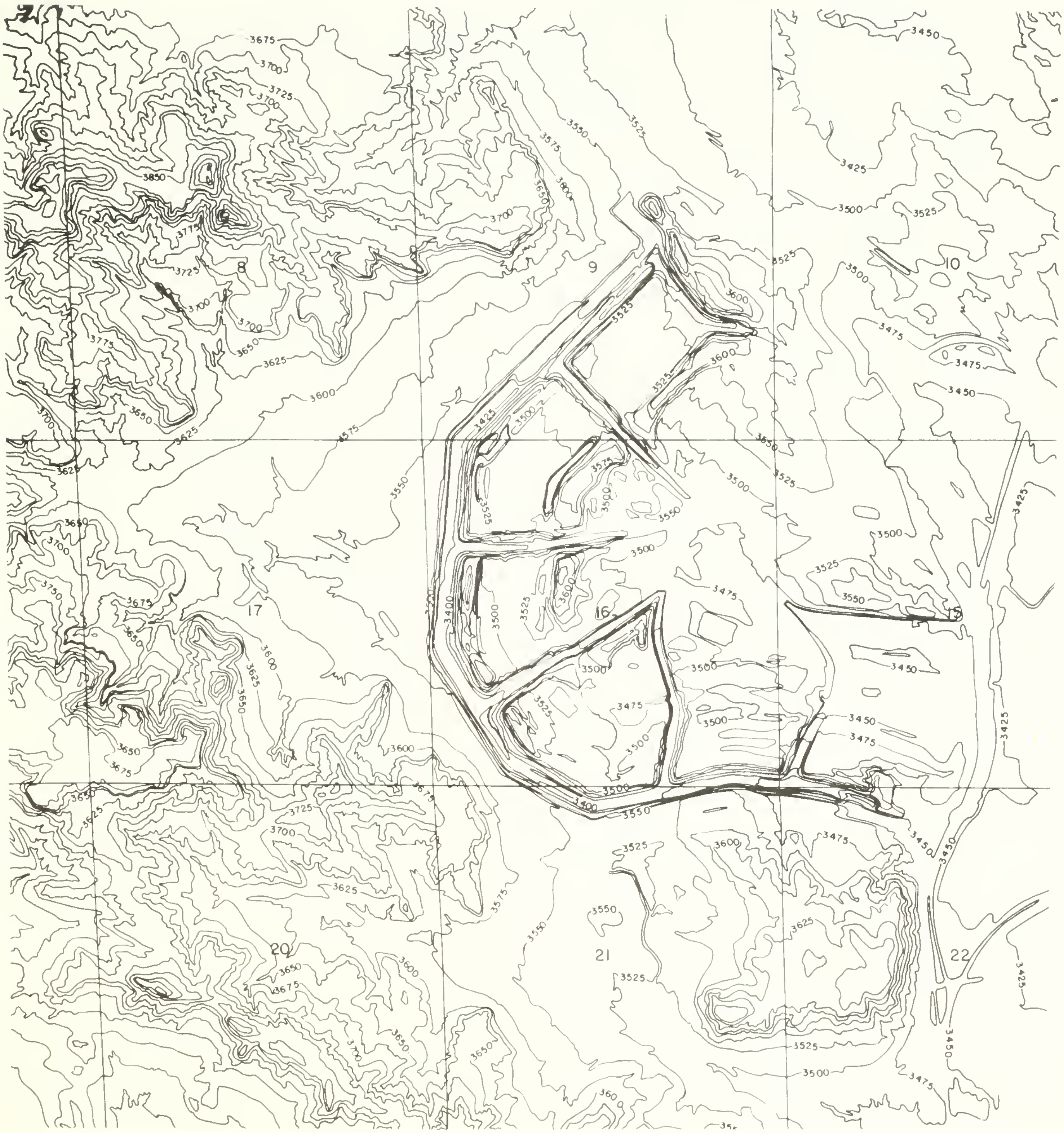


FIGURE I-4.--Existing topography at the West Decker mine.

the box cut outward is considered the mine exterior and the area inside the box cut, the interior (figure I-5). The interior would be mined in the future.

The Decker area is characterized by low, rolling hills and buttes. The vegetation includes Big sagebrush-shrub communities, grasslands, broadleaf communities along the perennial streams, and scattered conifers along the upper slopes and ridges. In addition, some of the area is devoted to agricultural use. The land in the area is primarily rangeland and is used for livestock grazing and wildlife habitat.

The semiarid climate in the Decker area is characterized by cold winters, warm summers, and a large variation in annual and seasonal precipitation and temperature.

E. COAL RESERVES

About 119.87 million tons of coal reserves lie beneath the existing leases at the West Decker mine:

D-1 Exterior----------	74,745,000 tons
D-1 Interior----------	35,555,000 tons
D-2 Interior----------	9,570,000 tons

If Decker Coal Company were to obtain the short-term leases from the BLM, an additional 38.6 million tons of coal would be mined.

The company is mining coal seams (table I-2) which are part of the Tongue River Member of the Fort Union Formation. With the exception of the D-1 seam, and the D-2 seam in the mine interior, the coal seams underlying the mine area are located at depths which preclude surface development. The U.S. Geological Survey is considering a stipulation to the short-term leases that would require the company to recover the D-2 coal seam in the exterior if the company were to obtain the short-term leases.

TABLE I-2.--Coal seams beneath the West Decker mine area

Decker name (Montana name)	Average thickness
D-1 upper (Anderson + Dietz 1*) and D-1 lower (Dietz 2*)------------------	52.0 feet
D-2 (Dietz 3)----------------------------	18.5 feet
D-3 (Canyon)----------------------------	21.0 feet
Carney (Wall)---------------------------	18.0 feet

*The Dietz 1 and Dietz 2 are one seam at West Decker.

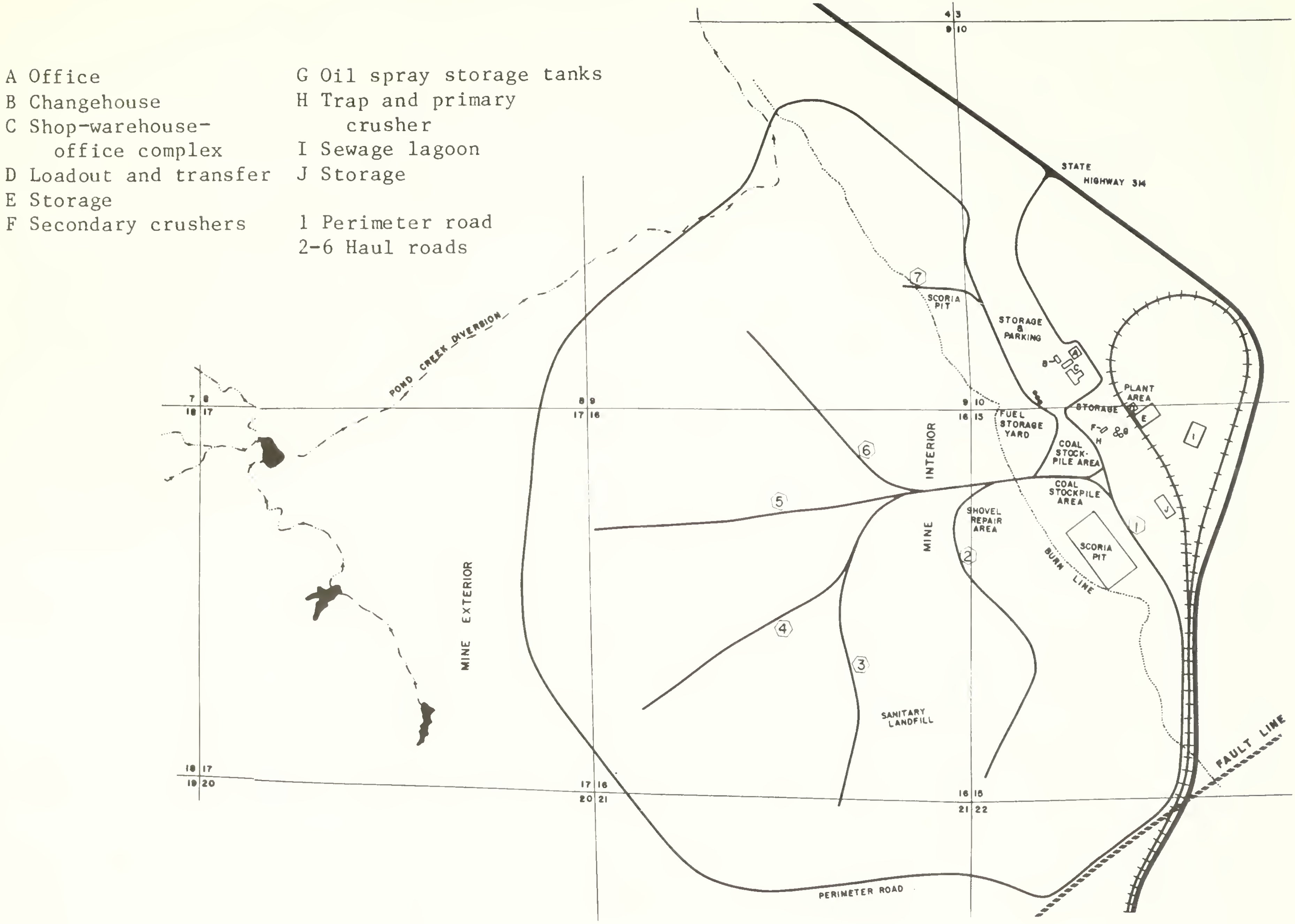


FIGURE I-5.--Facilities at the West Decker mine.

The following proximate coal analysis represents a weighted average of the estimated recoverable D-1 and D-2 reserves:

Subbituminous (as received)

Analysis	Seam D-1	D-2
BTU content (per pound)-------	9,553	9,262
Ash---------------------------	3.73%	5.25%
Moisture----------------------	25.51%	24.38%
Sulfur------------------------	0.33%	0.38%
Volatile matter---------------	33.50%	29.24%
Fixed carbon------------------	39.26%	41.46%

Decker coal is very marketable because of its high BTU value and low sulfur content.

F. FACILITIES

West Decker facilities include a railroad spur and loop, haul roads, ramp roads, coal handling and loading facilities, two coal storage silos, a mine office building, shop, warehouse, changehouse, and storage facilities for fuel and explosives (figure I-5). Approximately 14 unit trains (100 to 105 cars at 100 tons each) per week are loaded at the West Decker mine.

1. Haul Roads

Six scoria haul roads provide access from the loadout area to the horseshoe-shaped pit. Surface runoff is controlled by drainage ditches along the roadway, and two water spray trucks are used to control road dust. Water for the roads is obtained from settling ponds or from industrial wells, all located within the mine. When mining is completed, all haul roads will be blended with the final reclamation contours and revegetated according to applicable State and Federal regulations.

2. Handling Facilities

The raw coal handling facility at West Decker has been in operation since October 1972 and is comprised of a truck dump (traps), two primary and two secondary crushers, conveyors, transfer building, sampling station, loadout building and two storage silos. Each silo is 76 feet in diameter, 190 feet in height, and has a storage capacity of 13,500 tons. Raw coal is transported from the pit in 150-ton coal haulers, dumped at the trap, dropped to the primary crusher and is reduced to an 8-inch size. The coal is then transferred from the primary crusher to the secondary crusher where it is reduced to a 2-inch size. The raw coal is transferred from the secondary crusher to the loadout and sampling building and then to the storage silos. If the need arises, the coal can be loaded directly from the loadout into a unit train. The coal is transferred from the silos via conveyor to the transfer building. At the transfer building, coal is transferred to another conveyor belt which leads to the loadout and sampling building. As the coal passes through the loadout facilities it is treated with an oil spray and passes to the unit train for shipment. The oil spray system was installed to minimize the production of fugitive dust created during coal loadout operations and to help reduce dust problems associated with transportation and delivery to the power plant. Hot oil is applied at a rate of 2 gallons per ton.

Dust control systems have been installed to help control fugitive dust produced as a result of crushing operations. A water spray system is located on the primary feeders, primary crushers, and at the secondary crushers. A detergent additive is mixed with the water to decrease surface tension and delay evaporation. An air filter dust collector removes fugitive dust produced within the transfer building.

West Decker utilizes an outdoor coal storage pile in addition to the 27,000 tons of silo storage. Maximum pile capacity is approximately 180,000 tons. However, the average pile size is between 80,000 and 100,000 tons, and is determined by unit-train availability.

3. Fuel and Explosive Storage

Gasoline consumption is estimated at 126,000 gallons per year while diesel fuel consumption is approximately 1,600,000 gallons annually.

Gasoline is stored in two 10,000-gallon tanks and diesel fuel for mobile equipment is stored in four 16,800-gallon tanks and six 15,000-gallon tanks adjacent to the gasoline storage. Two diesel fuel tanks for the mixing of prills have a combined capacity of 13,000 gallons. Three 60,000-gallon tanks used for the storage of heavy oil (for the oil spray system) and a 1000-gallon storage tank is used for diesel fuel which fires burners to heat oil to be sprayed on coal.

Average explosive consumption is estimated at 7.5 million pounds per year.

4. Power Supply and Distribution

A new 34.5 kV powerline for the Spring Creek mine is being constructed through the West Decker mine. The powerline lies to the west, outside of the permit area and is being relocated to allow for mine expansion. "Stub" lines coming off the main line connect to portable transformers which distribute power to mining equipment. The design and construction of the powerline will be consistent with the

"Environmental Criteria for Electrical Transmission Systems" and REA standards for the protection of large birds from electrocution.

5. Water Requirements

Industrial water consumption at West Decker is estimated to be 544,000 gallons per day, distributed as follows:

Use	Gal/day
Dust control--------------	512,000
Equipment washdown (shop Robowash)---------	13,000
Plant washdown------------	5,000
Sanitary facilities-------	14,000

The water comes from settling ponds or from industrial wells. Water from an industrial well is pumped to a 150,000-gallon storage tank and used for various facilities, dust control, plant washdown, and for supplying the fire hydrants at the mine site. Two 16,000-gallon water trucks are used for dust control.

6. Sewage Disposal

A sanitary sewer lagoon constructed in the railroad loop adequately handles the office, shop, plant, and changehouse areas. The lagoon consists of two ponds in a series; the first being a settling pond for solid materials. An overflow pipe joins the ponds and the supernate discharges into the second pond which functions as an evaporation basin.

G. MINING ACTIVITY

A test shipment of 74,000 tons of coal was sent to Commonwealth Edison in 1970 and production in earnest began in August of 1972. Construction of the mine began in 1971. Actual production from the West Decker mine has been:

1972--------	792,949 tons	1976--------	10,256,047 tons
1973--------	4,159,287 tons	1977--------	10,377,708 tons
1974--------	6,874,365 tons	1978--------	8,979,815 tons
1975--------	9,283,351 tons	1979 (est.)-	7,000,000 tons

Total to date-- 57,723,522 tons

The company would mine to the north until the coal burn line is encountered and would mine to the southeast until the fault line is encountered (figure I-5). Mining techniques presently used at West Decker allow 94-percent recovery of the mineable coal. Mining activity would terminate at such time as one or more of the following conditions are encountered:

- Economic stripping limit is encountered.
- Adverse safety conditions are encountered.
- Mining operations approach within 100 feet of the proposed mine boundary.

The acreage to be disturbed is estimated as follows:

	5-year disturbance		Mine-life disturbance	
Leases:	With	Without	With	Without
Disturbance:				
Mining level----------------	1,730.83	1,882.39	2,293.59	2,768.91
Spoils banks and ramp roads-	116.51	116.51	10.91	10.91
Associated------------------	1,397.87	1,566.31	940.71	905.00
Total---------	3,245.21	3,565.21	3,245.21	3,684.82

The estimated timetable for each phase of the mining operation from January 1979 to end of mine-life follows:

Phase I: Existing exterior mining activity would proceed until September 1981.

Phase II: Begin exterior mining operations on a two-pit basis, (west and south) as determined by coal lease and property boundary limitations- September 1981.

- Begin mining interior of mine in conjunction with existing mining activities- January 1984.
- Terminate mining in South pit- September 1985.

Phase III: Begin mining in West pit in conjunction with interior mining activities September 1985.

Phase IV: Terminate mining in West pit- December 1989.

- Terminate mining interior- June 1994.

Phase V: Final reclamation procedures completed in south pit by December 1986.

- Final reclamation procedures completed in west pit by December 1991.
- Final reclamation procedures completed within interior of mine- December 1996.

Phase VI: Remove fill from 25.5 acres of East Decker rail spur and revegetate December 1996 (or when no longer utilized by East Decker).

Figures I-6 and I-7 show the proposed mine sequence without and with the short-term leases.

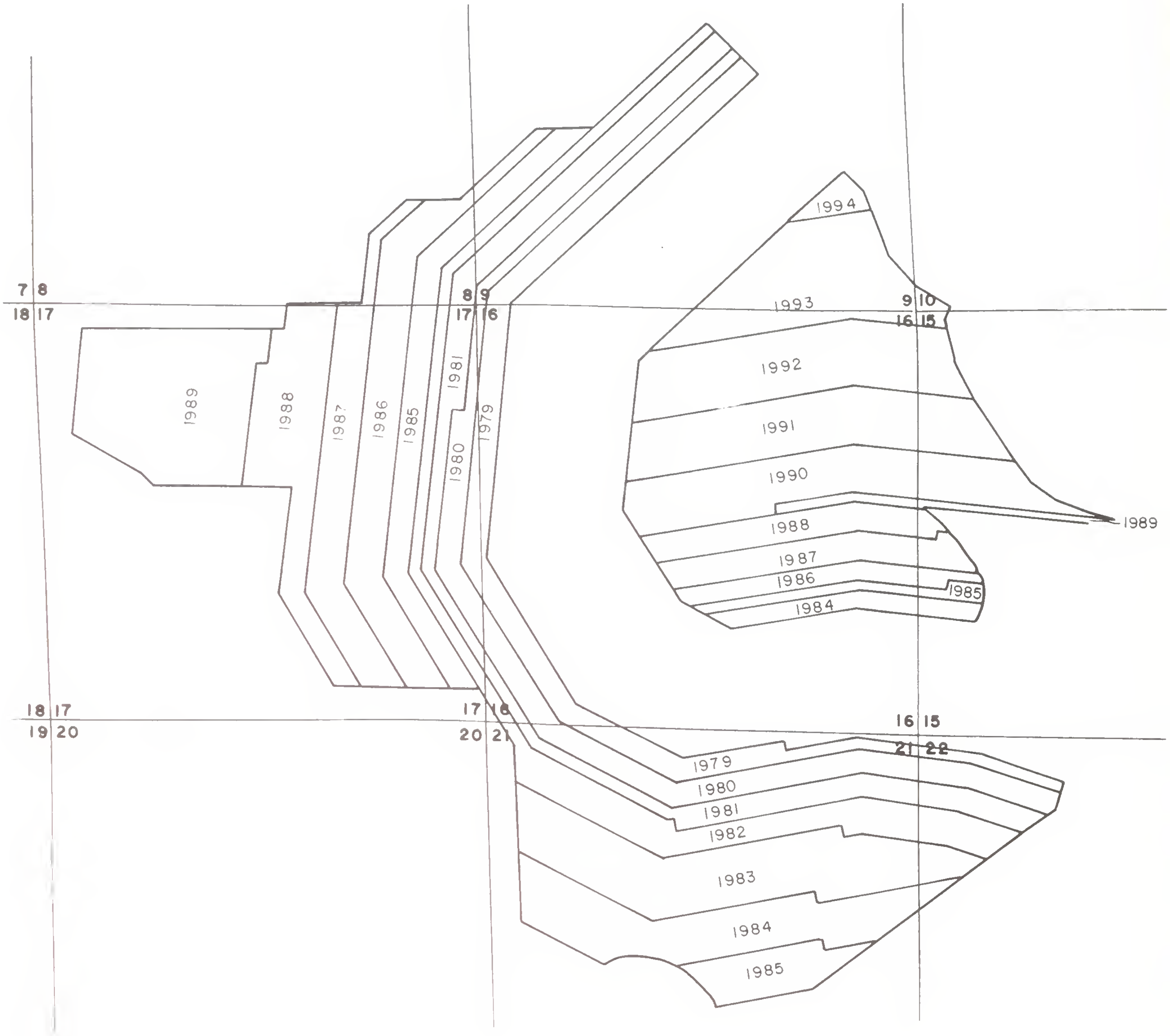


FIGURE I-6.--Mining sequence, without the short-term leases.

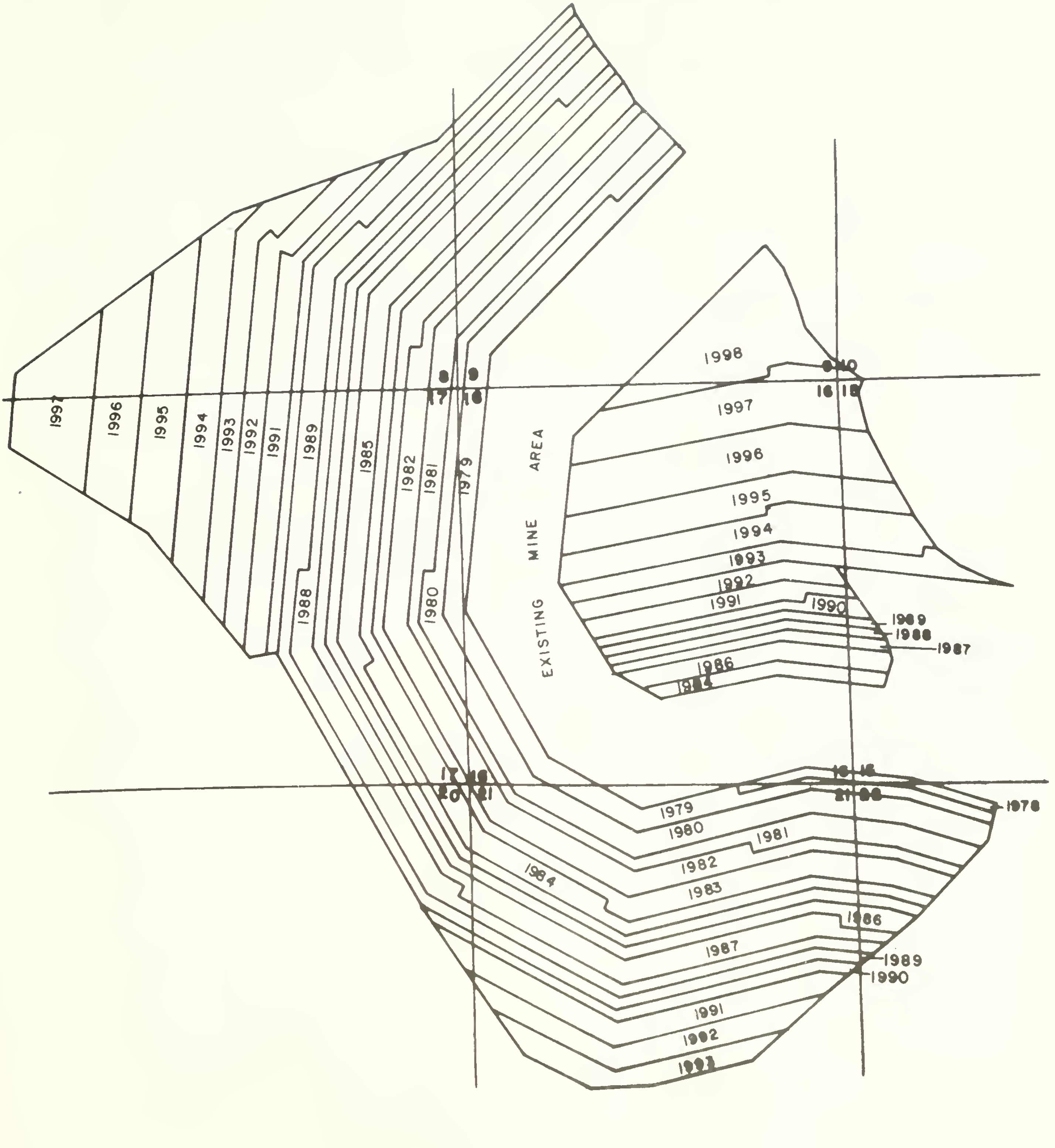


FIGURE I-7.--Mining sequence, with the short-term leases.

To insure maximum recovery of the coal the company would continue to salvage a 2-foot rider seam above the D-1 and the coal fender located between the coal surface being mined and the spoil material. The rider seam lies above a 1-foot shale parting throughout the West Decker mine reserves. After the rider seam has been salvaged, the shale parting is removed, exposing the main coal seam for mining.

The coal fender is a wedge of coal left as the result of mining operations on the spoil side of the existing pit. A backhoe removes the spoil material from the spoil side of fender, thus exposing the entire wedge. The coal wedge is then leveled and ripped with a D-9 dozer and removed by scrapers to the coal storage pile.

The recovery of coal by future mining operations would not be detrimentally affected as the result of current or proposed mining plans. The company does not plan to deposit overburden, build structures, or otherwise proceed with operations that would adversely affect the recovery of the coal adjacent to Decker Coal Company property.

1. Employment Schedule

The work force at West Decker consists of 198 craft employees and 49 salaried or overhead employees. There is no longer any major construction, production has stabilized, and the work force would remain relatively constant until the end of mine-life.

2. Public Safety

Access to the mine and facilities is controlled by a fence enclosing a major portion of the mine area. All visitors and unauthorized personnel are required to check into the main office before entering the mine area. The mine area is patrolled 24 hours a day by mine security personnel to prevent unauthorized entrance to the mine site. A blasting sign identifying warning signals is displayed at the mine entrances. All blast areas are appropriately marked and all roads leading to a blast area are blocked off prior to blasting.

3. Method of Mining

All available topsoil in the affected area is removed and placed on regraded spoils; however, if insufficient surface area is available, then the stripped topsoil is stockpiled for future redistribution on regraded spoils. After topsoil removal, the area is drilled and blasted to aid the draglines in the removal of overburden. Presently, two draglines are working in tandem using the split bench method of operation. One dragline removes the top lift while the second dragline follows on the lower bench and spoils the lower lift thus uncovering coal.

As the coal is uncovered, the top of the coal seam is cleaned and the first 1 to 2 feet of coal is salvaged, exposing an 8-inch parting seam. This parting material is ripped and hauled, and used as backfill.

The area of exposed coal averages 150 feet wide and 50 feet deep. This is blasted and mined in 2 lifts, each approximately 25 feet thick, and hauled to the loadout area.

a. Water Management

Surface and ground water drainage entering the mine is pumped into settling ponds for mine use or discharge. All settling facilities are designed and constructed to insure compliance with all applicable State and Federal statutes and regulations pertaining to mine effluent and surface water diversion. All new settling ponds constructed would be of sufficient size to store the sediment necessary to meet effluent limitations and sediment control measures. The company currently monitors mine water discharges under MPDES Permit Number MT-0000892.

Diversions are designed, constructed, and maintained in a manner to prevent additional contributions of suspended solids to streamflow or to runoff outside the permit area, to the extent possible, using the best technology currently available. All diversion structures are classified as temporary structures and when no longer needed would be removed and the area reclaimed. The Pond Creek diversion (figure I-5) is the only existing stream channel diversion at West Decker. It was constructed to prevent drainage from the Pond Creek watershed from flooding the mine. After mining is complete Pond Creek would be returned to its premining alignment and the diversion channel would be graded, topsoiled, and seeded to blend with the surrounding topography.

Decker Coal Company has an ongoing hydrologic study at the mine which is a combination of a Montana Bureau of Mines and Geology study and a monitoring program maintained by Decker Coal Company. In 1970, the Montana Bureau of Mines began a study in the Decker area to determine premining hydrologic conditions, to establish a ground-water observation program, and to monitor and understand mining-related hydrologic changes. (See Van Voast and Hedges, 1975, and Van Voast and others, 1978).

b. Topsoil Removal and Storage

All topsoil is removed prior to drilling for blasting, mining, or other surface disturbances to prevent topsoil contamination by spoil or waste materials. Soil samples are taken in each different soil type to determine all possible topsoil for salvage. A 6- to 12-inch layer that includes the A and portions of the B horizon is removed, stockpiled, and replaced as the surface soil layer. The remaining B and the C horizon is then stripped and stockpiled and replaced as a separate layer. Stockpiles are protected from excessive weed growth and water and wind erosion by planting the following seed mixture at the first normal period for favorable planting:

Species	Pure Live Seed lbs./acre
Western wheatgrass---------	5.0
Slender wheatgrass---------	5.0
Pubescent wheatgrass-------	3.0
Vernal alfalfa-------------	2.0
Total--	15.0

Topsoil stockpiles that would be disturbed within 1 year are seeded with a quick-growing cover of small grain or winter graze in place of the above mixture.

c. Overburden Removal

Overburden material removed from the box cut (first cut) was stored in spoil piles and, at the end of mine-life, would be used to fill in ramp roads. Overburden material from each successive cut is deposited, by dragline, in the space left from the proceeding cut.

d. Coal Mining, Loading, and Hauling

The exposed coal seam is blasted, removed, and loaded into 150-ton trucks by electric coal shovels. The estimated production rate is shown in table I-3. If a permit is obtained for the North Extension (see USDI and MDSL, 1977) production would approximate that shown in table I-4.

4. General Reclamation

All final grading on the affected mine area would approximate the original contour of the land (figure I-8). The grading and backfilling operations would not be conducted more than two spoil ridges behind the pit being worked. With the exception of highwalls, railroad loops, and access road cut-and-fill through unmined lands, no final graded slopes would exhibit an overall slope in excess of five horizontal to one vertical (5:1). Highwalls would be graded to no greater than a 3:1 slope, unless an alternate reclamation plan is approved. If the short-term leases were not obtained, the final topography would be altered from that shown in figure I-8. After permanent vegetation has been established, the land would be returned to rangeland, wildlife habitat, and watershed.

Pond Creek drainage would be relocated to its approximate original location and would be stabilized with grass and shrub plantings. In grassed waterways the seed mixtures presented in table I-5 would be used. Similar drainage patterns would replace those removed or disturbed by mining.

TABLE I-3.--Estimated production (tons) from the West Decker mine

Year	Without short-term leases (X 1,000)	With short-term leases (X 1,000)	Permit denial (X 1,000)
1980------	6,787	6,787	5,578
1981------	5,050	5,050	---
1982------	5,150	5,150	---
1983------	5,338	5,338	---
1984------	6,600	6,600	---
1985------	7,200	7,200	---
1986------	7,875	7,875	---
1987------	8,000	8,000	---
1988------	8,000	9,000	---
1989------	8,000	8,000	---
1990------	8,000	8,000	---
1991------	8,000	8,000	---
1992------	8,000	8,000	---
1993------	8,000	8,000	---
1994------	8,000	8,000	---
1995------	8,000	8,000	---
1996------	3,870	8,000	---
1997------	---	8,000	---
1998------	---	8,000	---

1999------	---	8,000	---
2000------	---	---	---
2001------	---	---	---
Total---	119.87 million tons, mining ends in 1996	158.504 million tons, mining ends on 2001	63.288 million tons, mining ends in 1980

Following grading, the affected area is scarified to increase the permeability of the spoil, to promote root penetration, and to help prevent slippage between the spoil and the topsoil. In the case of abandoned roads, the roadbeds would be ripped, disced, or otherwise conditioned before topsoil is replaced.

a. Topsoil Redistribution

Topsoil would be redistributed to a depth of about 20 inches in order to achieve a uniform thickness consistent with the postmining land use. The C and portions of the B horizon would be laid down first, followed by the 6-inch layer which includes the A and the remainder of the

TABLE I-4.--Estimated production with the North extension

Year	West Decker (tons X 1,000)	North extension (tons X 1,000)	Combined (tons X 1,000)
1980---------	6,787	---	6,787
1981---------	3,915	1,135	5,050
1982---------	3,669	1,481	5,150
1983---------	3,751	1,587	5,338
1984---------	4,601	1,999	6,600
1985---------	5,167	2,033	7,200
1986---------	5,373	2,502	7,875
1987---------	5,464	2,536	8,000
1988---------	5,461	2,539	8,000
1989---------	5,637	2,363	8,000
1990---------	Remains the	Remains the	8,000
thru 2002-------	same	same	8,000/year

TABLE I-5.--Pond Creek seed mixture

Species	lbs./acre	Species	lbs/acre
Green needle grass-----	2.0	Cicer milk vetch----	1.0
Western wheatgrass-----	4.0	Eski sainfoin-------	3.0
Thickspike wheatgrass--	4.0	*Western yarrow------	0.25
Pubsecent wheatgrass---	2.0	*Silver sage---------	0.125
Regar brome------------	1.0	*Wild rose-----------	0.25
Canada wild rye--------	1.0	*Western snowberry---	0.25
		Total--------	18.875

*Not pure live seed; the grasses and legumes are pure live seed.

B horizons. All the topsoil would be chiseled and harrowed for initial seed bed preparation.

All areas would be seeded within a 90-day period following the redistribution of topsoil. Extreme care would be taken to guard against erosion during and after application. Redistributed topsoil would be reconditioned by discing, ripping, or other appropriate methods. Fertilizer (18-46-0) would be added with prior approval by the Department.

b. Planting and Revegetation

Decker Coal Company intends to establish a diverse, effective, and permanent vegetative cover of predominately native species of

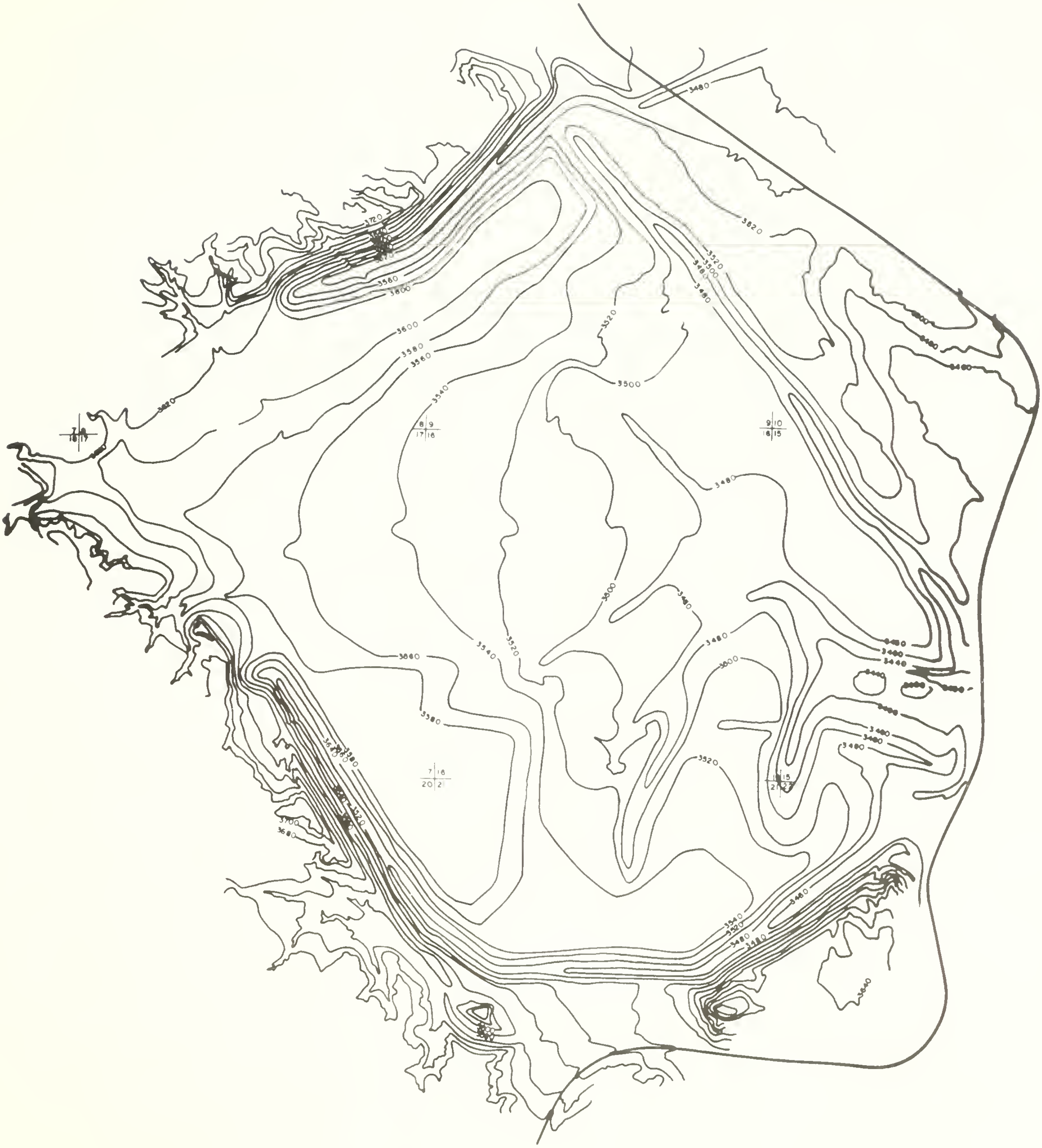


FIGURE I-8.--Postmining topography at West Decker. [See figure I-4 for comparison] herbaceous or shrubby vegetation suitable for grazing or browsing. Areas would be planted or seeded during the first appropriate season following completion of grading, topsoil redistribution, and remedial soil treatments.

The revegetation plan is designed to encourage prompt recovery of vegetative cover and productivity and to stabilize the soil surface. The vegetative cover (table I-6) is intended to consist of a mixture of species, intended for use on rangeland, that compares to the utility of naturally occurring vegetation during each season of the year and is intended to fulfill the needs of wildlife, including food, water, cover, and space.

TABLE I-6.--General reclamation seed mixture

Species	Lbs./acre
Western wheatgrass	4.0
Thickspike wheatgrass	2.0
Slender wheatgrass	3.0
Whitmar wheatgrass	3.0
Alkalai sacaton	1.0
*Big sagebrush	0.125
*Western yarrow	0.25
*Blue flax	0.25
Green needlegrass	3.0
Four-wing saltbush	1.0
Pubescent wheatgrass	1.0
*Purple prairie clover	0.25
Sainfoin	3.0
Sideoats grama	2.0
Indian ricegrass	1.0
Total	24.875

*All seed, except for these, are pure live seed.

After planting, all permanent reclamation would be hydromulched with forest fiber wood mulch at a rate of 2,000 pounds per acre. All the reclaimed areas, in their first growing season, would be mowed with a rotary mower to eliminate weed seed production and at the same time, provide some additional mulch and reduce the moisture competition between the grass and weeds.

Experimental plantings at West Decker have consisted of native shrub species provided by the U.S. Forest Service. These plantings have not had a high degree of success. Presently, West Decker is collecting seeds of forbs and shrubs from within the permit area for planting. The following species are being collected and would be planted as follows:

Species	Lbs./acre
Four wing saltbush------------	1.0
Big sagebrush-----------------	0.125
Eski sainfoin-----------------	3.0
Western yarrow----------------	0.25
Blue flax---------------------	0.25
Purple prairie clover---------	0.25
Total---------	4.875

Also, winterfat, skunkbush sumac, rubber rabbitbrush, and fringed sage would be broadcast on select sites ahead of the brillion seeder. This would insure maximum contact with the soil. The sites to be planted would be determined by slope, aspect, and drainage.

c. Abandonment of the Mine

All backfilling and grading would be completed within 90 days after the Department has determined that the operation has been completed or that a prolonged suspension of work in the area would occur. Final pit reclamation would proceed as close behind the coal loading operation as the frequency and location of ramp roads, the use of overburden stripping equipment in highwall reclamation, and other factors may allow.

Before permanent abandonment of mining operations, all openings and excavations, including water discharge points, would be closed or backfilled, or otherwise permanently dealt with in accordance with sound engineering practices. Drill holes, trenches, and other excavations for exploration, development, or prospecting would be properly plugged, backfilled, graded, topsoiled, and revegetated according to sound engineering practices and reclamation standards so as to protect the surface and to not endanger any present or future underground operations or any deposit of oil, gas, other mineral resources or ground water.

In addition to final reclamation procedures as noted the company would dismantle and remove all equipment, building, miscellaneous fencing, storage tanks, etc. After all mine associated facilities have been dismantled and/or removed, the affected area would be backfilled, graded and revegetated as necessary to blend with the existing terrain and environment.

CHAPTER II

DESCRIPTION OF THE EXISTING ENVIRONMENT

A. GEOLOGY

1. Topography and Geomorphology

The West Decker mine is in the lower reaches of the Pond Creek drainage, an ampitheater shaped drainage opening to the east. The permit area ranges from 3,420 to over 3,700 feet in elevation (figure I-4). Natural slopes range from less than 5 percent to over 50 percent. Much of the upland areas exhibit badland characteristics, having steep slopes and little vegetation. The northeastward flowing Tongue River and Tongue River Reservoir, which are the base level for all streams draining the region, are the dominant geomorphic feature. Mining is altering the existing topography and drainage systems as it progresses into the higher overburden areas on the permit boundaries.

Langbein and Schumm (1958, in Schumm, 1977) found that the maximum amount of sedimentation occurred under a 12-inch precipitation regime due to a lack of dense vegetative cover and rainfall rates sufficient to induce erosion. More recent data (Denby and Bolton, 1976, in Schumm, 1977) suggest that 13- to 18-inch precipitation regimes are the most erosive. The Decker area, with a 12.4-inch average annual precipitation rate, probably has fairly high natural erosion rates compared to the U.S. as a whole.

Erosion rates on undisturbed areas at West Decker probably range from near 0 to over 20 tons/acre/year (t/ac/yr) and probably average 5 t/ac/yr (derived from the Universal Soil Loss Equation, King and others, 1977). Variability in the estimated erosion rates is due to several factors, the most important of which are geology, climate, slope, and vegetation. Empirical data and predictive equations are lacking for this area; however, the company plans to initate studies to quantify the erosion rates of undisturbed and reclaimed lands.

Erosion rates are usually highest during spring thaw and periods of intense or prolonged rainstorms. Sheetwash and rain splash are probably the major processes causing erosion, although gullying may be significant locally.

2. Stratigraphy

The Fort Union Formation, stata of continental deposits formed in lakes, swamps, and river environments, is predominant at the surface. The Tongue River Member is the most important unit within the Formation.

Located in the upper 900 feet of the Fort Union, the Tongue River Member is composed primarily of nonmarine sandstone with interbedded shale and coal and contains upwards of ten persistent coal seams. Both the interburden and coal thickness are quite variable.

Within the permit area the strata are composed of poorly sorted sandstone, siltstone, silt, and carbonaceous shale, all of which can intergrade, both horizontally and vertically, over short distances. The strata have a regional southeastward dip of less than one degree. Of the coal seams identified within the permit area (see chapter I), only the top two, the D-1 and the D-2, are considered economically recoverable.

The overburden above the D-1 seam varies from a minimum of a few tens of feet to over 300 feet. The D-1, formed from the merging of the Anderson-Deitz 1 and the Deitz 2 seams, varies from 44 to 58 feet in thickness. In the mine area the D-1 has an upper rider seam 1- to 2-feet thick which is separated from the remaining D-1 seam by a fairly consistent 8-inch thick shale layer (figure II-1). The D-1 coal has been mined from a portion of the interior mine area.

Interburden between the D-1 and D-2 seams varies from 30 feet, to the west, to 70 feet, along the southeast corner, averaging 39 feet. The interburden thickness decreases to the north and west. Approximately 1 mile to the west of the proposed mine boundary, the D-1 and D-2 seams merge. The D-2 seam varies from 16 to 22 feet in thickness. Decker calculations indicate that the high overburden, 400 feet in places, precludes mining the D-2 seam in the exterior.

Some or all of the D-1 seam east of the mine area burned forming fused and baked clinker deposits (figure I-5). To the southeast is a northeastward trending fault where the strata have been downthrown 240 feet, lowering both the D-1 and the D-2 to unmineable depths. The burn and the fault preempt mining from extending to the Tongue River Reservoir.

Colluvial (mass-wasting or sheetwash) deposits and an alluvial (concentrated runoff) deposit mantle much of the underlying bedrock and are generally less than 10 feet deep within the permit area. Valley fill deposits in the Pond Creek drainage may reach upwards of 25 feet.

3. Paleontology

No important paleontological resources have been identified in the Decker region. Significant paleontological remains are known to exist in the Tongue River Member of the Fort Union Formation (Brown, 1962), but none have been found near Decker. No important vertebrate sites have been identified in the Tongue River Member.

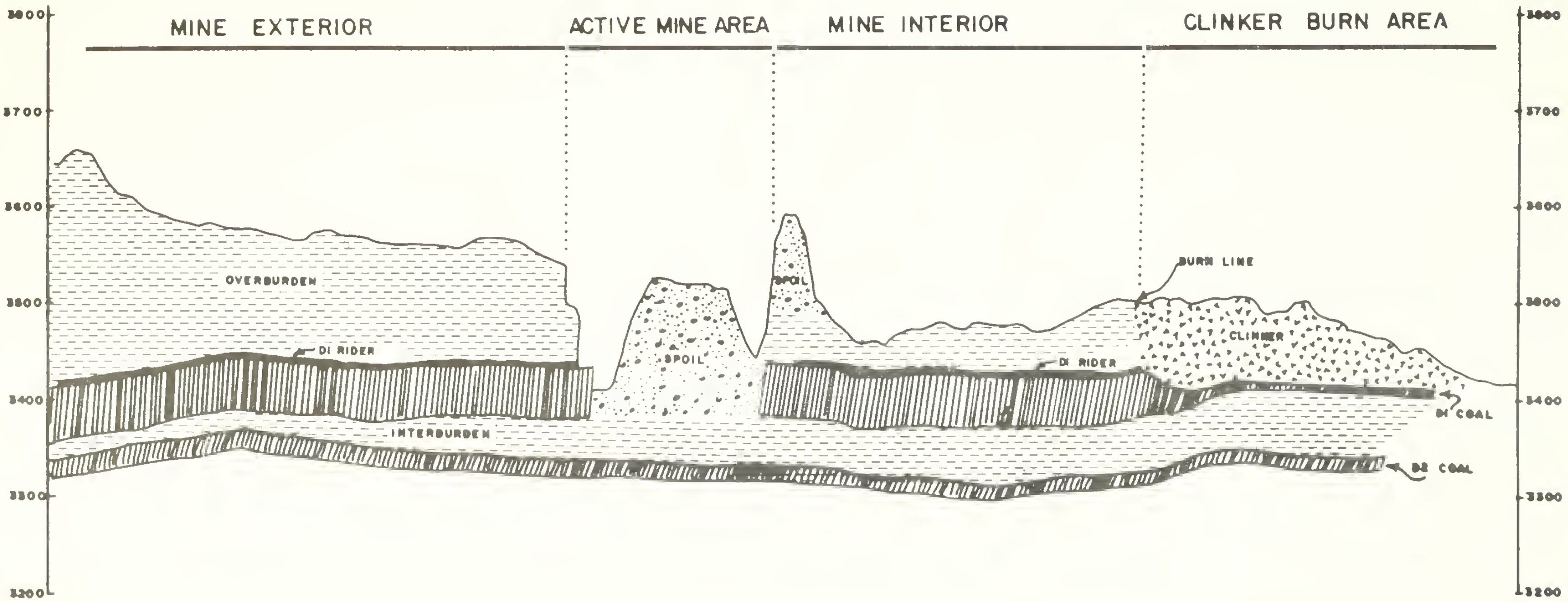


FIGURE II-1.--Stratigraphy in the West Decker mine area.

4. Minerals Other Than Coal

There are no known oil or gas reserves within the permit area. Of the five wildcat wells drilled to test Cretaceous formations all were dry. Two of these wells are located within the permit area.

Clinker is abundant along the northeastern margins of the mine area and pits are located in areas where they are needed for use on road surfaces, as riprap, etc. Alluvial materials are present but are not extensively used.

5. Overburden

The overburden within the proposed mine area (both interior and exterior) is characterized by relatively high sodium levels (SAR values averaging about 28), fine textures (predominantly silty clay and silty clay loam), and a dominance of 2:1 clays with high shrink/swell potential (smectites).

In addition, nickel values routinely exceed the State suspect level (1 ppm), averaging approximately 3.5 ppm. Molybdenum levels slightly exceed the State suspect level (0.3 ppm), averaging about 0.5 ppm.

All other parameters required by the Department of State Lands fall within the State suspect levels, with few significant exceptions. Core hole 1733-78 (SW 1/4, SE 1/4, Sec. 17) exhibits elevated boron, salinity, and nitrate levels to a depth of 40 feet.

B. HYDROLOGY

1. Ground Water

a. Aquifers

Within the permit area, the Anderson-Dietz 1 and the Dietz 2 coal seams (the D-1), and the clinker from the D-1 burn are the major sources of ground water of reasonable quality. Adjacent to the area, the Tongue River alluvium is a source of good water. Other potential aquifers within the permit area contain little or no water, or are of limited geographic extent. These include the Pond Ceek alluvial fill deposits, the clinker capping hills in the northern and southeastern corners of the permit area, the thin Tongue River terrace deposits at the extreme southeastern limits of the permit area, and a discontinuous sandstone lens in the overburden and interburden.

Most of the coal aquifers in this area are artesian. Water will rise in wells above the elevation of the aquifer, moving upwards until gravity equals the pressures in the water (piezometric elevation).

Table II-1 summarizes the flow rate, transmissivity, and the quality of the aforementioned aquifers. The Dietz 4, Dietz 5, and Dietz 6 coal seams lie below the level of mining.

TABLE II-1.--Aquifer characteristics at the West Decker mine

Aquifer	Flow rates (gal/min)	Transmissivity (gal/day/ft)	Quality (mg/L)[1]
Anderson-Dietz 1	10-50	112-1,120	1,620-3,600
Dietz 2	10-50	*	930-2,100
Clinker	*	can be fairly high	1,000-1,500
Pond Creek alluvial-colluvial deposits	2-5	*	depends on incoming water
Dietz 3 through Dietz 6	200-300	*	1,000-1,200
Mine spoils	*	0.2-1,000	1,000-7,500
Overburden	Variable	*	2,375-8,000

[1] Milligrams of total dissolved solids per liter of water.
*These data are unavailable.

Ground water entering the Pond Creek drainage tends to converge near the lowest part of the basin (figure I-4). A fault located to the southeast is a water barrier, diverting ground water to the middle of the basin.

b. Ground Water Quality

Total dissolved solids (TDS) concentrations, indicators of the major cations and anions in the water, vary considerably between and within aquifers. Coal aquifers in the Decker region are characteristically a sodium-bicarbonate type and exhibit TDS ranges of less than 1,000 to upwards of 4,000 mg of TDS/liter of water (table II-1). TDS in the Anderson-Dietz 1 and Dietz 2 aquifers, which are less mineralized, range from 1,000 to 2,000 mg/L. Deeper coal aquifers are usually less mineralized than waters from shallow aquifers.

Water from wells drilled into the overburden usually contain much higher TDS levels, averaging 5,300 mg/L. Clinker and alluvial deposits produce water of fairly good quality in the West Decker area (2,000 mg/L TDS in the alluvium, and 1,000 to 1,500 mg/L TDS in the clinker).

Water standards for human consumption recommend that TDS levels not exceed 500 mg/L, but water of this quality is rare in eastern Montana. Some domestic wells in the region contain TDS levels in excess of 4,000 mg/L. Irrigation water exceeding 2,000 mg/L will usually create saline problems. Livestock can usually tolerate water that is below 5,000 mg/L without noticeable effect.

Within 1.5 miles of the proposed permit area 25 water wells are in use: 9 stock, 9 observation, 4 domestic, and 3 industrial wells. Three of the four domestic wells, tapping the Anderson-Dietz 1, are fairly high in TDS (1,600, 2,200, and 4,800 mg/L)(Van Voast and Hedges, 1975).

Observation wells in the reclaimed spoils have variable water quality, probably related to the amount and type of soluble salts in the spoils, to flow directions and rates, and to the quality of the entering ground water. Water in the spoils at Decker, sodium-bicarbonate dominated, usually contain higher TDS (average 2,400 mg/L) than the undisturbed coal aquifers but less TDS than the overburden aquifers. Relatively pure Tongue River water probably mixes with chemicals in the spoils raising TDS levels. When mine activities have ceased and the area is reclaimed, total dissolved solids would probably stabilize at lower levels.

c. Effects of Mining to Date

Prior to mining, ground water in the Anderson-Dietz 1 seam flowed towards the Tongue River and the Tongue River Reservoir, which acted as a base level. Mining has altered the movement of the ground water creating a new base level in the mine area, 1.5 miles west of the Reservoir. Thus, the ground water gradient has been reversed and ground water now flows from the Reservoir and the River towards the pit (figure II-2). The floor of the pit is roughly 20 feet below the elevation of the Reservoir at high stage.

The total rate of inflow into the pit from the Anderson-Dietz 1 aquifer and from upward leakage of the Dietz 2 averages about 25 gallons per minute (gpm), roughly equal to the peak use of several households. The Dietz 2 coal seam contributes approximately 17 gpm to the Anderson-Dietz 1 aquifer (65 percent of the total). Combined flow rates for the Anderson-Dietz 1 and Dietz 2 coal seams probably range from 45 to 65 gpm (USDI and MDSL, 1977).

When the mine intercepted a small portion of the clinker along the northeastern boundary, pit inflow increased an additional 290 gpm. Backfilling with spoil has reduced this inflow considerably.

The mine has also intercepted the Pond Creek alluvial aquifer which is underlain by an impermeable shale strata. The 2-5 gpm flow in this aquifer is sufficient to keep the alluvium saturated along the pit wall and create unstable conditions. The company is aware of the unstable condition and has taken steps to drain this material by installing a French drain (a large, ribbed, galvanized culvert pipe with holes in it, placed vertically into the gravels). This system has been approved by the Department of State Lands but cannot be implemented until the necessary permits from the Department of Health and Environmental Sciences are received. At present, water from the Pond Creek aquifer drains into the pit and is pumped to retention ponds.

The Tongue River Reservoir acts as a hydrologic boundary, strongly buffering any changes from one side of the Reservoir to the other. As

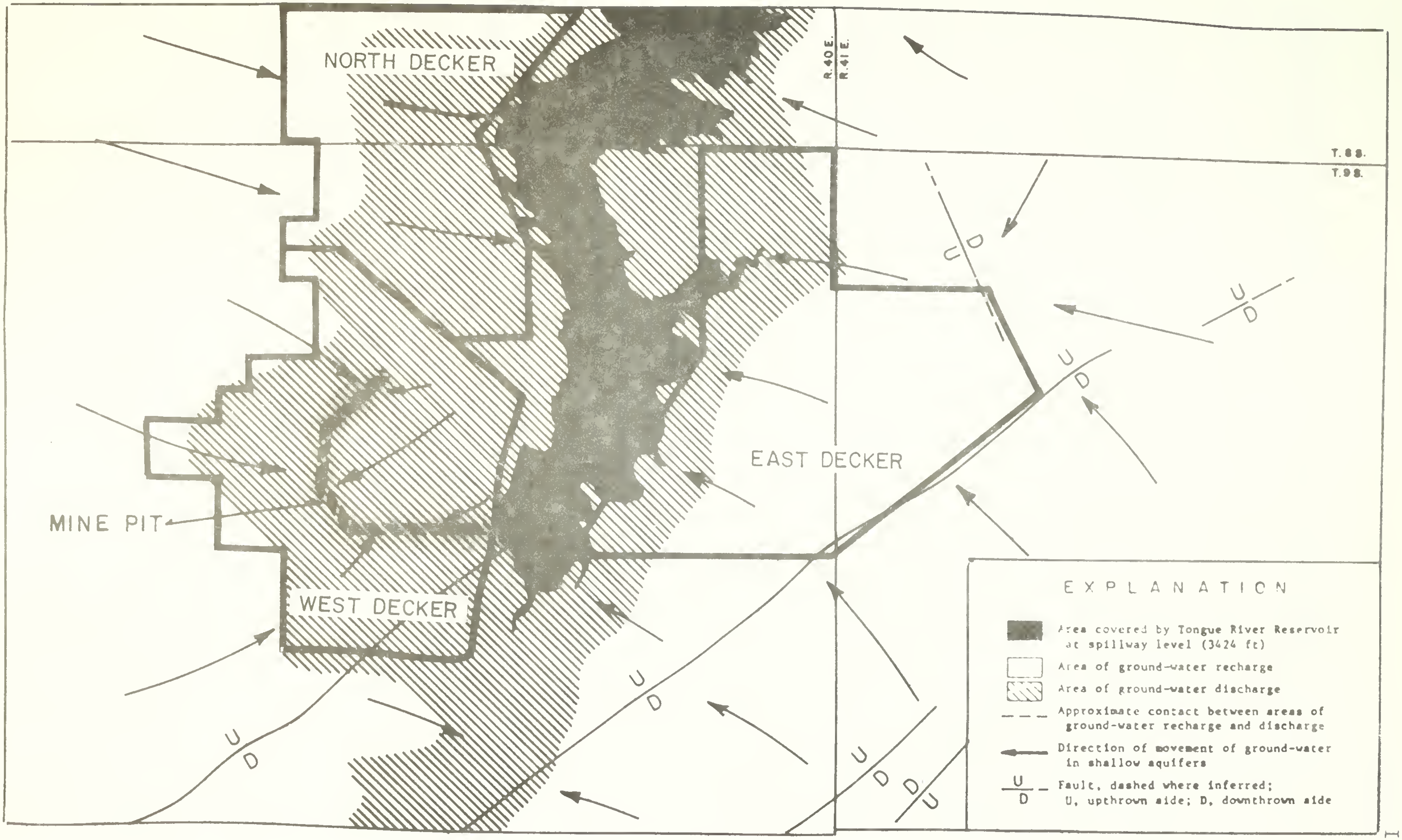

NORTH DECKER
EAST DECKER
WEST DECKER
MINE PIT
R.40E.
R.41E.
T.8S.
T.9S.
U
D
EXPLANATION
Area covered by Tongue River Reservoir at spillway level (3424 ft)
Area of ground-water recharge
Area of ground-water discharge
Approximate contact between areas of ground-water recharge and discharge
Direction of movement of ground-water in shallow aquifers
Fault, dashed where inferred; U, upthrown side; D, downthrown side

FIGURE II-2.--Ground water flow in the Decker area.

such, the effects of mining are isolated to the immediate vicinity (Van Voast and others, 1978).

2. Surface Water

Three surface water systems are in or near the West Decker mine: the Tongue River and the Tongue River Reservoir, the West Decker mine discharge, and Pond Creek and its tributaries. The Tongue River, originating in the Big Horn Mountains, flows northeastward through Wyoming and into Montana, joining the Yellowstone River at Miles City.

The Reservoir, finished in 1939, backs up water to an elevation of 3,424 feet, covers 3,500 acres at full capacity, and is the base for both surface runoff and shallow ground water aquifers (see chapter II, Ground Water) from the mine area. It also is an effective sediment trap, retaining 80 percent of the incoming suspended sediment. Water quality in the Reservoir is similar to that in the River which the Montana Department of Health and Environmental Sciences has classified as $B\text{-}D_2$: suitable for drinking water if it is adequately treated.

Despite the good quality, some game fish from the Reservoir contain mercury (Hg) levels exceeding U.S. Food and Drug Administration (FDA) guidelines for human consumption (0.5 micrograms of mercury per gram of food-- ugHg/g). Mercury levels were consistantly near or below the detectable limit (0.05 ugHg/liter) in the Reservoir inflow and outflow, and in the East and West Decker mine discharges. Mercury concentrations in the surficial sediment of the Reservoir averaged 0.04 ugHg/g-- an extremely low accumulation considering the concentrations in fish (Phillips, 1980).

Discharges from the East and West Decker mines contributed only 0.4 percent of the total flow and 0.15 percent of the suspended sediment which entered the Reservoir from November 1978 to September 1979. Of this, West Decker contributed only 0.03 percent of the total water inflow and even less of the total suspended sediment. Since mercury levels are very low and the amount of inflow contributed by mine effluent is also small, the mine at West Decker cannot be considered an important contributing source of mercury to the Reservoir.

Naturally occurring bacteria in the Reservoir water probably are converting the organic mercury in the sediments and/or water to methylmercury, a much more toxic and bioaccumulative form. Bottom feeders and algae accumulate methylmercury, passing it along the food chain to further concentrate in carnivorous fish. Northern pike had the highest levels of mercury of the species sampled, but all game species sampled included individuals exceeding FDA guidelines (Phillips, 1980). Older fish, which are usually larger, contained more mercury per pound. These larger fish, which contain mercury at levels that exceed FDA guidelines, are rarely caught by sport fishermen, but fishermen should be aware that large game fish from the Reservoir may have increased mercury levels.

Van Voast and Hedges (1975) reported a steady decline in TDS, bicarbonate, sodium, and sulfate ions in mine effluent since mining began in 1972. This is due in part to increased dilution by ground water flow entering the mine pit through intercepted clinker units (see chapter II, Ground Water).

Pond Creek, the principal drainage, flowed due east through the middle of the existing mine prior to mining. It has since been diverted northward, to skirt the mine area, and empties into a tributary of Pearson Creek (figure I-5). Almost half of the 6-square mile drainage areas lies above the overflow diversion channel. This channel was designed to handle a 340 cfs (cubic feet per second) peak flow and would be upgraded to handle 730 cfs, if the proposed mine and reclamation plan is approved. The estimated TDS level for Pond Creek is 1,200 to 2,500 mg/L (USDI and MDSL, 1977).

Three stock ponds were built in the Pond Creek drainage prior to mining. Since 1976 several other impoundments have been built to control runoff. All the impoundments have significantly reduced runoff by increasing evaporation and ground water recharge.

C. CLIMATE

The semiarid climate at Decker is characteristic of the continental steppes of the Northern Great Plains. Precipitation is low but variable and is confined primarily to the warmer months of the year. Daily temperature variations are large and seasonal temperature variations are pronounced. Both surface humidity and prevailing wind speeds are moderate.

During the 30 years of record (1949-79), total annual precipitation has ranged from 6.5 to 19.4 inches with an annual average of 12.2 inches (figure II-3). About 47 percent, 5.7 inches, of the annual precipitation occurs from April through June. An additional 28 percent occurs, mostly as snow, from October through March. The remainder, 3.1 inches, generally occurs as summer thunderstorms (figure II-4). During the period from January 1973 through January 1977, hail fell only four times. In a normal year, precipitation in some form would occur on 73 days. The frequency of intense precipitation events is similar to that of other areas in eastern Montana; 1 inch of precipitation occurring in 6 hours can be expected every 2 years. Other recurrence intervals are shown in table II-2.

The 3 years of data collected at Decker recorded an annual mean temperature of 43°F and annual mean relative humidity of 63 percent. Humidity was highest (76 percent) and temperature lowest (-27°F) in January, whereas when the temperature was highest (87°F) in August, the relative humidity was lowest (53 percent). Although the free-free period is 90-100 days long, low precipitation and high temperatures terminate the effective growing season in mid-summer.

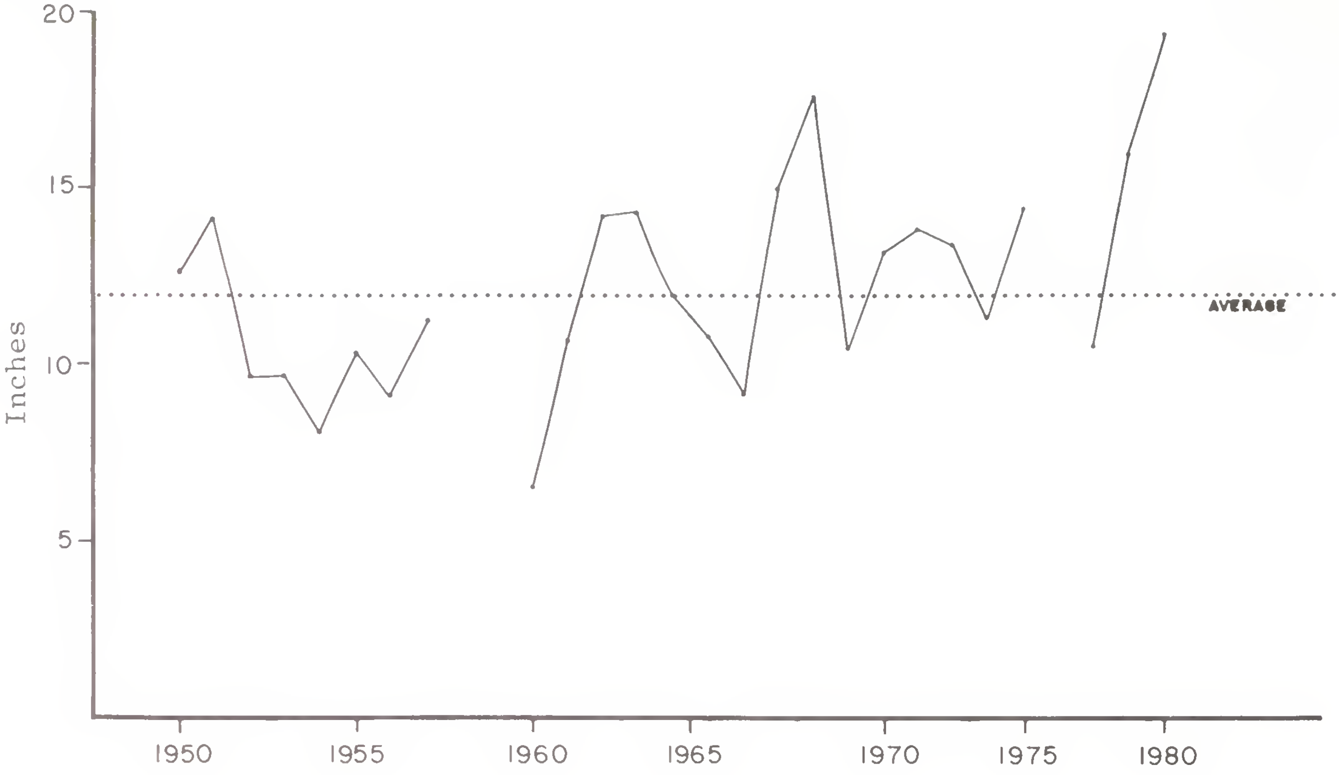


FIGURE II-3.-- Annual precipitation in the Decker area(NOAA, 1949-79).

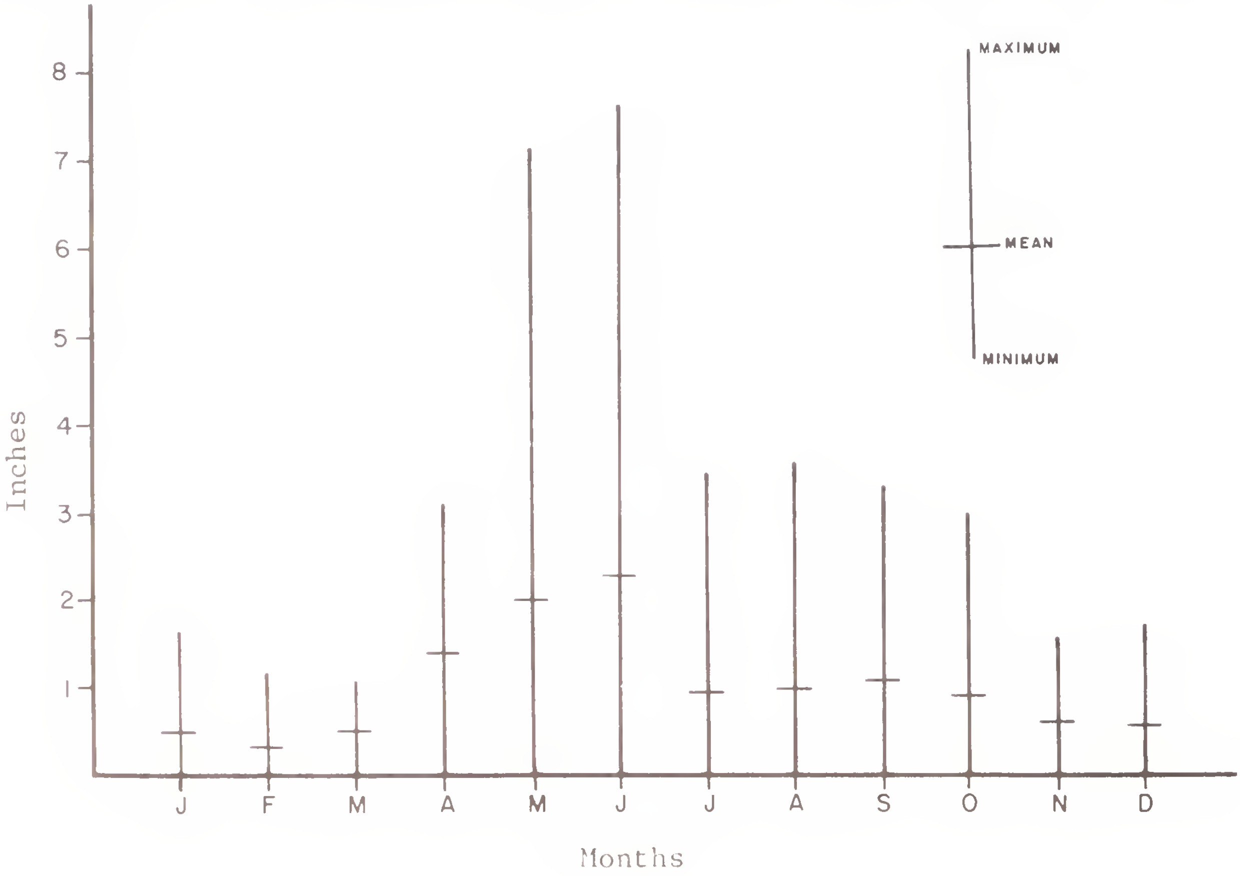


FIGURE II-4.--Monthly precipitation range at Decker (1949-79).

TABLE II-2.--Magnitude and frequency of precipitation that can be expected in the Decker area
(from Miller, Frederick, and Tracey, 1973)

[Point precipitation in inches for given recurrence interval]

Duration (minutes)	Recurrence interval (years) 2	5	10	25	50	100
5-----	0.19	0.28	0.32	0.41	0.47	0.55
10-----	.30	.43	.50	.63	.73	.85
30-----	.52	.75	.87	1.11	1.28	1.49
60-----	.66	.95	1.10	1.40	1.62	1.85
120-----	.75	1.04	1.20	1.55	1.76	2.01
180-----	.82	1.16	1.30	1.68	1.89	2.12
360-----	1.00	1.30	1.60	2.00	2.20	2.40
720-----	1.20	1.60	1.80	2.35	2.55	2.85
1,440-----	1.40	1.90	2.20	2.80	3.00	3.40

Annual mean wind speed at Decker since 1976 has been 4.4 miles per hour (mph), with a maximum recorded speed of 30 mph occurring in November 1977. Wind speed and wind direction showed little seasonal variation. Winds from the northwest were most common, occurring 16 percent of the time the wind was blowing (table II-3).

A detailed analyses of regional climate can be found in the Northern Powder River Basin Coal regional analysis (USDI and MDSL, 1979, 1980).

D. AIR QUALITY

Some deterioration of the downwind ambient air quality adjacent to the permit area has occurred. For the period August 1977 to July 1979 total suspended particulate (TSP) concentrations at the AQB site (figure II-5) were three times the TSP concentration measured upwind at site #3. The AQB site is, however, located near FAS 314. Highway traffic may therefore be contributing to the ambient particulate concentrations. The elevated levels of TSP appear to be associated with the coal handling facilities as evidenced by the higher concentrations recorded at sites #1 and #2 (table II-4, figure II-6) located near those facilities. Suspended particulates do not travel long distances; monitoring sites #6 and #7, located 2.6 and 3.8 miles, respectively, east of the loadout facilities recorded TSP concentrations that were not statistically different from TSP concentrations recorded at upwind site #3. These concentrations were similar to pristine areas in southeastern Montana (USDI and MDSL, 1979, 1980). During the period August 1977 to July 1979 the TSP concentrations (table II-4) recorded were well below the Federal secondary ambient air

TABLE II-3.--Wind speed and direction at the West Decker mine (average values for the period 1977-79)

Month	Wind speed (mph) Mean	Wind speed (mph) Maximum	Direction of maximum	N	NE	E	SE	S	SW	W	NW
January---	3.9	26	NW	22	9	7	9	12	7	9	24
February--	4.4	26	W	14	8	7	13	15	9	16	20
March-----	4.9	30	SW	10	9	8	12	14	11	20	19
April-----	5.4	25	NW	12	11	14	11	9	8	16	19
May-------	5.4	25	NW	8	8	10	11	13	13	22	17
June------	3.8	22	NW	10	10	16	13	13	12	12	18
July------	4.0	20	NW	16	17	13	12	13	11	6	12
August----	4.4	19	No data	11	13	12	13	17	11	13	10
September-	3.8	25	SW	10	10	11	16	12	14	13	21
October---	3.8	20	NW	8	8	10	19	14	19	15	6
November--	4.6	30	No data	14	5	3	6	18	21	16	16
December--	4.6	24	No data	22	8	6	7	11	7	18	25
Annual----	4.4	30	SW	13	11	11	12	13	10	13	16

Wind direction columns N–NW: as a percentage of time blowing.

standards for both annual geometric mean (60 ug/m^3, not to be exceeded more than once per year) and maximum 24-hour concentrations (150 ug/m^3, not to be exceeded more than once per year). Sporadic episodes of reduced visibility occur on FAS 314 during periods of high winds due to dust originating at the Decker mines, and at the Big Horn mine to the south.

Total particulate emissions at the Decker mining complex average about 1,800 tons per year, with 50 percent of these emissions at West Decker. Coal and noncoal (overburden and topsoil) particulate (appendix A) account for 23 and 77 percent, respectively, of the total emissions.

The major source of coal particulate is the outdoor storage piles which account for 243 tons, 58 percent, of the annual coal dust emissions. This may be an overestimate since the stored coal is not crushed and therefore few fine easily entrained particles are present. The coal handling and transport facilities are considered an example of the best available technology for dust emissions control (EPA, 1979) and coal particulate emissions from these facilities are about 75 tons per year (appendix A).

The primary sources of the noncoal particulate emissions at the minesite are overburden and topsoil removal and replacement and haul road traffic. They account for 328 tons (24 percent), 450 tons (32 percent), and 373 tons (27 percent), respectively of the annual noncoal emissions

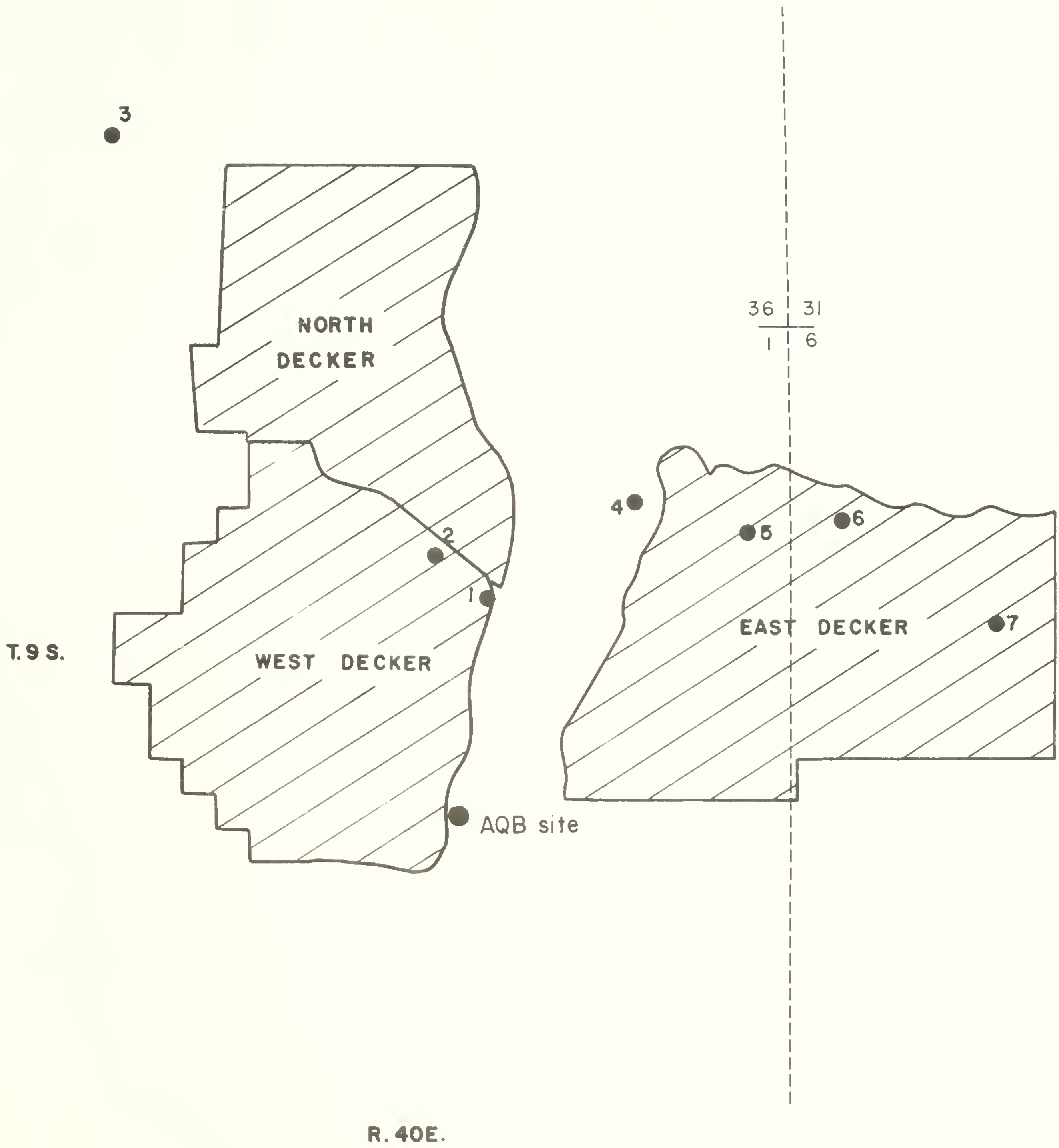


FIGURE II-5.--Location of the Hi-volume samplers at the Decker mines.

TABLE II-4.--Air quality monitoring summary for the Decker area total suspended particulates (ug/m^3)

Site	8-77 to 12-77 AGM*	8-77 to 12-77 Max	8-77 to 12-77 2nd hi	1-78 to 12-78 AGM	1-78 to 12-78 Max	1-78 to 12-78 2nd hi	1-79 to 7-79 AGM	1-79 to 7-79 Max	1-79 to 7-79 2nd hi
1----	37.2	154.0	75.2	30.9	130.0	92.5	27.6	77.6	71.6
2----	47.1	171.0	126.0	21.4	204.0	95.3	28.8	102.0	88.0
3----	11.6	32.9	30.0	13.3	47.1	40.9	14.6	43.0	34.5
5----	24.0	99.8	47.2	18.4	125.0	83.6	25.1	78.4	66.1
6----	16.4	65.1	34.8	16.5	70.8	61.7	19.2	63.2	50.0
7----	17.1	56.3	47.5	18.0	75.2	69.7	19.7	53.6	41.8
AQB--	[1]40.3	148.0	122.0	[2]56.0	209.0	97.0	[3]40.0	22.0	111.0

*Annual Geometric Mean.

[1] Jannuary to December 1977.

[2] January to June 1978.

[3] January to September 1979.

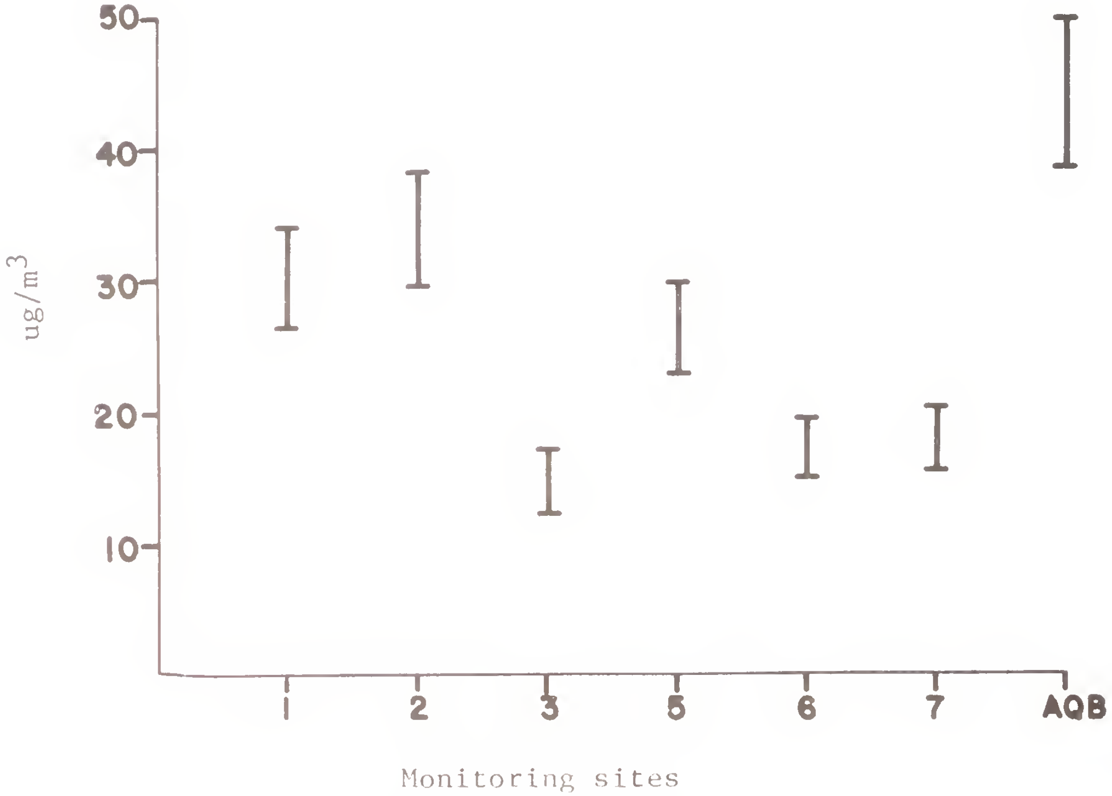


FIGURE II-6.--Geometric mean for the period August 1977 to July 1979 of total suspended particulate (TSP) concentrations near Decker. [95th percentile confidence limits are shown] total. Some reduction of dust from these sources is possible (see chapter IV, Alternatives).

The primary gaseous pollutants directly associated with the mining activity are nitrogen oxides (NO_x) and carbon monoxide (CO) (appendix A). These account for 43 and 44 percent, respectively, of the 2,440 tons of gaseous emissions occurring annually. Internal combustion engines, both diesel and gasoline, are the major sources. During inversions, CO and NO_x possibly accumulate in the area of active mining, i.e. the pit. The gases, however, are probably not a major problem off the permit area.

The gaseous and particulate emissions caused by mine associated population (appendix A, see chapter II, Ecomomics: Employment) occur almost exclusively in the Sheridan, Wyoming, vicinity, and therefore contribute to the total emissions in that area. Since the majority of workers commute to Decker from Sheridan, there has also been an increase in pollutants along FAS 314. These emissions are composed almost entirely of CO and occur during morning and afternoon periods of peak traffic.

E. SOILS

The soil resource in the West Decker mine area can be divided into two groups: 1) those soils in the exterior (west and south of the present pit) and 2) those soils in the interior (figure I-5).

Soils in the exterior area are formed primarily (56 percent) on alluvial fans and terraces, and are heavily weighted towards sandy loams. Of the salvageable soil resource in the exterior area, 74 percent is derived from soils formed on these alluvial fans and terraces. Interior area soils are formed in residual parent materials (58 percent) and are finer textured (sandy clay loam to clay loam). Alluvial soils represent a greater portion (49 percent) of the salvageable soil resource than their areal extent would indicate, although to a lesser degree than in the exterior area.

Table II-5 lists the soil series mapped in the West Decker area and their taxonomic classification. Profile descriptions and laboratory analyses are not presented, but are on file and available at the Montana Department of State Lands, Helena, Montana; the Office of Surface Mining, Denver, Colorado; and from Decker Coal Company, Decker, Montana.

Table II-6 and figure II-7 detail the soil mapping units and their location in the proposed mining area. Mapping unit descriptions are also on file and not presented here.

The soils as a reclamation resource are quantified in the exterior and interior areas in table II-7. Both company-proposed salvage depths and potential salvage depths are presented. Potential depths are based on data and profile descriptions provided by the company as a part of the application. While there are differences at the mapping unit level, the net differences are minor. Actual salvage would be based on soil sampling just prior to salvage and would possibly exceed the volume reported under "potential volume (acre-feet)." Alluvial soils frequently are salvaged to a depth in excess of 60 inches.

TABLE II-5.--Soils series and taxonomic classification

Series	Description
Anko[1]	Haplustollic Natrargids, fine-loamy, mixed, mesic
Corkim[1]	Ustollic Camborthids, coarse-loamy, mixed, mesic
Keiser[2]	Ustollic Haplargids, fine-silty, mixed, mesic
Kim[2]	Ustic Torriorthents, fine-loamy, mixed (calcareous)
McRae[2]	Ustollic Camborthids, fine-loamy, mixed, mesic
Midway[2]	Ustic Torriorthents, clayey, montmorillonitic, (calcareous), mesic
Nelson[2]	Ustic Torriorthents, coarse-loamy, mixed (calcareous), mesic
Okar[1]	Haplustollic Natrargids, fine, montmorillonitic, mesic
Olney[2]	Ustollic Haplargids, fine-loamy, mixed (calcareous), mesic, shallow
Sperlin[1]	Ustic Torriorthents, coarse-loamy, mixed (calcareous), mesic
Tassel[2]	Ustic Torriorthents, loamy, mixed (calcareous), mesic shallow
Travessilla[2]	Lithic Ustic Torriorthents, loamy, mixed (calcareous), mesic
Tullock[2]	Ustic Torripsamments, mixed, mesic
Valent[2]	Ustic Torripsamments, mixed, mesic
Wanetta[2]	Ustollic Haplargids, fine-loamy over sandy or sandy skeletal, mixed, mesic
Wibaux[2]	Lithic Ustic Torriorthents, loamy, mixed (calcareous), mesic
Yenlo[1]	Haplustollic Natrargids, fine-loamy, mixed, mesic

[1] Soil series names developed specifically on the Decker Coal Company soil survey in the absence of suitable established series for identification purposes.

[2] Established series-- National Cooperative Soil Survey.

Most of the soils in the proposed mine area are silty and sandy range sites (10- 14-inch precipitation zone). Range in excellent condition, in favorable years, would be expected to produce 1,800 to 2,400 pounds of air-dry herbage per acre. In dry years productivity would drop as much as two-thirds (USDA and others, 1977)(see chapter II, Soils).

Table II-6.--Soil mapping units

MU[1]	Mapping unit name[2]
2	Alluvial lands, loamy
4	Corkim loam
4C	Corkim loam
5	Sperlin-Wibaux laoms (Sperlin- 50%, Wibaux- 40%)
6	Kim loam
7	Keiser silty clay loam
13	Yenlo-Anko complex (Yenlo- 55%, Anko- 45%)
15	Yenlo-Anko complex (Yenlo- 55%, Anko- 45%)
17	Shingle-Midway complex (Shingle- 35%, Midway- 35%, shallow)
17E	Shingle-Midway complex (Shingle- 35%, Midway- 35%)
18	Tassel-Shingle loams (Tassel- 40%, Shingle- 40%, shallow)
18E	Tassel-Shingle loams (Tassel- 40%, Shingle- 40%)
19	Shingle-Travessilla complex (Shingle- 45%, Travessilla- 45%)
20	Shale outcrop
21	McRae loam
22	Valent-Tullock laomy sands (Valent- 65%, Tullock- 35%)
23	Wanetta loam
26	Nelson-Tassel fine sandy loams (Nelson- 65%, Tassell- 35%)
27	Shingle-Midway-Shale outcrop complex (Shingle- 35%, Midway- 35%, Shale- 30%)
28	Tassel-Corkim loams (Tassel- 55%, Corkim- 45%)
29	Shingle-Wibaux-Shale outcrop complex (Shingle- 40%, Wibaux- 40%, Shale- 20%)
30	Olney fine sandy loam
31	Keiser-Okar silty clay loams (Keiser- 50%, Okar- 45%)
32	Alluvial lands, lomay saline
40	Terrace escarpemtns, loamy

[1] Mapping unit.

[2] Where percentages do not equal 100, the difference is made up by inclusions. Generally these inclusions are deeper than the principal soils in the complex.

TABLE II-7.--Soils within the permit area

MU[1]	Acreage	Company salvage[2]		Potential salvage[3]	
		depth (inches)	volume (acre-feet)	depth (inches)	volume (acre-feet)
		Exterior soils			
2------	23.41	60.0	117.1	60.0+	117.1+
4------	10.62	60.0	53.1	60.0+	53.1+
6------	127.05	24.0	254.1	39.0	412.9
7------	110.33	60.0	551.7	43.0	395.4
13-----	7.74	19.5	12.6	10.0	6.5
15-----	31.42	18.6	48.7	15.4	40.3
17-----	54.54	12.0	54.5	12.0	54.4
17E----	45.31	18.0	68.0	15.0	56.6
18E----	5.09	18.0	7.6	19.0	8.1
19-----	12.68	12.0	12.7	6.0	6.3
20-----	23.04	0	0	0	0
21-----	25.76	40.0	85.6	40.0	85.6
22-----	37.12	53.7	116.1	53.7	116.1
23-----	16.98	30.0	42.5	60.0+	85.0+
26-----	106.39	27.6	244.7	24.6	218.1
27-----	79.37	8.4	55.6	9.8	64.8
28-----	1.69	33.6	4.7	38.0	5.4
29-----	1.12	9.6	0.9	12.8	1.2
30-----	68.47	30.0	171.2	57.0	325.2
31-----	37.61	46.8	146.7	38.4	120.4
40-----	36.66	60.0	183.3	60.0	183.3
Totals-	862.33	----	2,281.4	----	2,405.8
		Interior soils			
4C-----	2.13	60.0	10.7	60.0+	10.7+
5------	2.64	19.8	4.4	23.6	5.2
18-----	11.84	12.0	11.8	12.0	11.8
18E----	8.74	18.0	13.1	19.0	13.8
28-----	86.51	33.6	242.2	38.0+	274.0+
30-----	35.69	30.0	89.2	57.0	169.5
31-----	41.44	46.8	161.6	38.4	132.6
32-----	2.94	----	----	----	----
Totals-	191.94		533.0		617.6+

[1] Mapping unit.

[2] Average depth of salvageable soil: company-proposed salvage--exterior: 31.8 inches, interior: 33.3 inches, potential salvage--exterior: 33.5 inches, interior: 38.6 inches. Tenths of inches result from combining two or more soil series in one mapping unit.

[3] Depths with (+) indicate that lab analyses were arbitrarily stopped at a given depth, usually 60 inches. Soils would be salvaged completely regardless of depth.

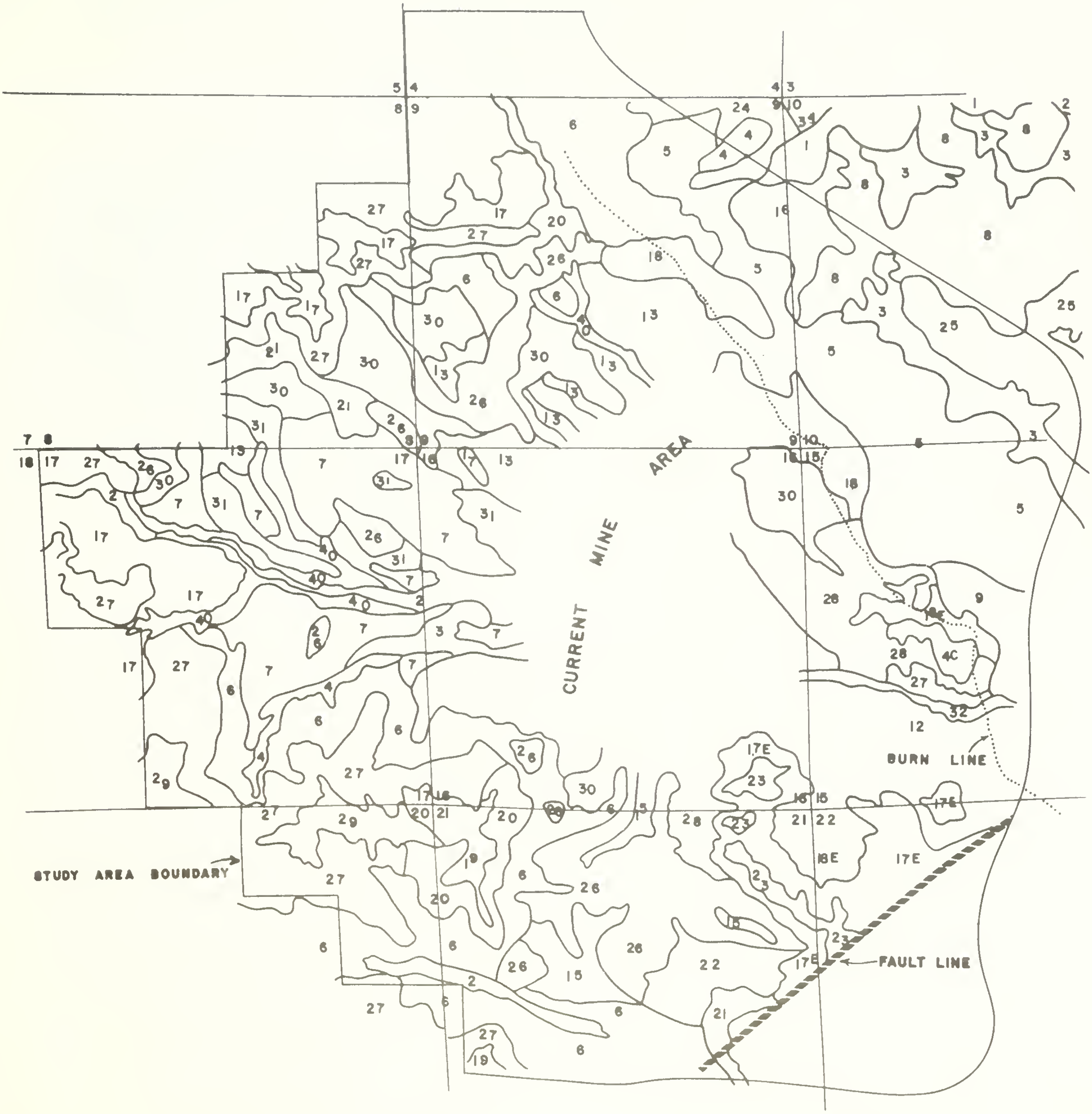


FIGURE II-7.--Soil mapping units within the study (permit) area.

F. VEGETATION

Vegetation in the proposed mine area is dominated by perennial grasses and shrubs. Six vegetative associations have been delineated in the proposed mine area (figure II-8 and table II-8) and are described below. Each association includes several individual plant communities which are described in detail in the application.

1. Big Sagebrush-Grassland

The big sagebrush-grassland type is the most widely distributed of the vegetative associations found in the permit area. It generally occurs on gently rolling benches at low to mid elevations. Dominant species vary in response to changing soils types. Western wheatgrass and needle-and-thread grass are the codominant grasses on the more clayey soils. Rubber rabbitbrush and saltbush are commonly found with big sagebrush. On the loamier sites, big sagebrush decreases in dominance while the wheatgrasses and needlegrasses increase in the overstory. Blue grama grass and threadleaf sedge commonly are found in the understory.

Both forms of the big sagebrush-grassland communities ae frequently subject to overgrazing and have subsequently been invaded by species such as cheatgrass, Japanes brome, and broom snakeweed.

2. Grassland-Mixed Shrub

This type occurs on sites that are somewhat drier than those sites occupied by the big sagebrush-grassland. The dominant species, although the same, occur in different proportions. Bluebunch wheatgrass is commonly dominant. The greatest diversity of broadleaf species is usually found in this type. In addition to big sagebrush, saltbush, and rabbitbrush, it is common to find broom snakeweed and winterfat. Leguminous forbs, such as clovers, are generally dominant in the spring, while composites, such as the asters, become an important part of the community later in the summer and into fall.

Typically, the grassland-shrub communities occur on hilltops and well-drained benches. The associated soils are usually of marginal thickness.

3. Silver Sagebrush-Grassland

Silver sagebrush-grasslands occur on moister sites. This type is not common in the area. Where it occurs, it is usually found in gently sloping drainages with well developed loams, and is commonly subirrigated. In addition to the needlegrasses and wheatgrasses, sandberg bluegrass is also common.

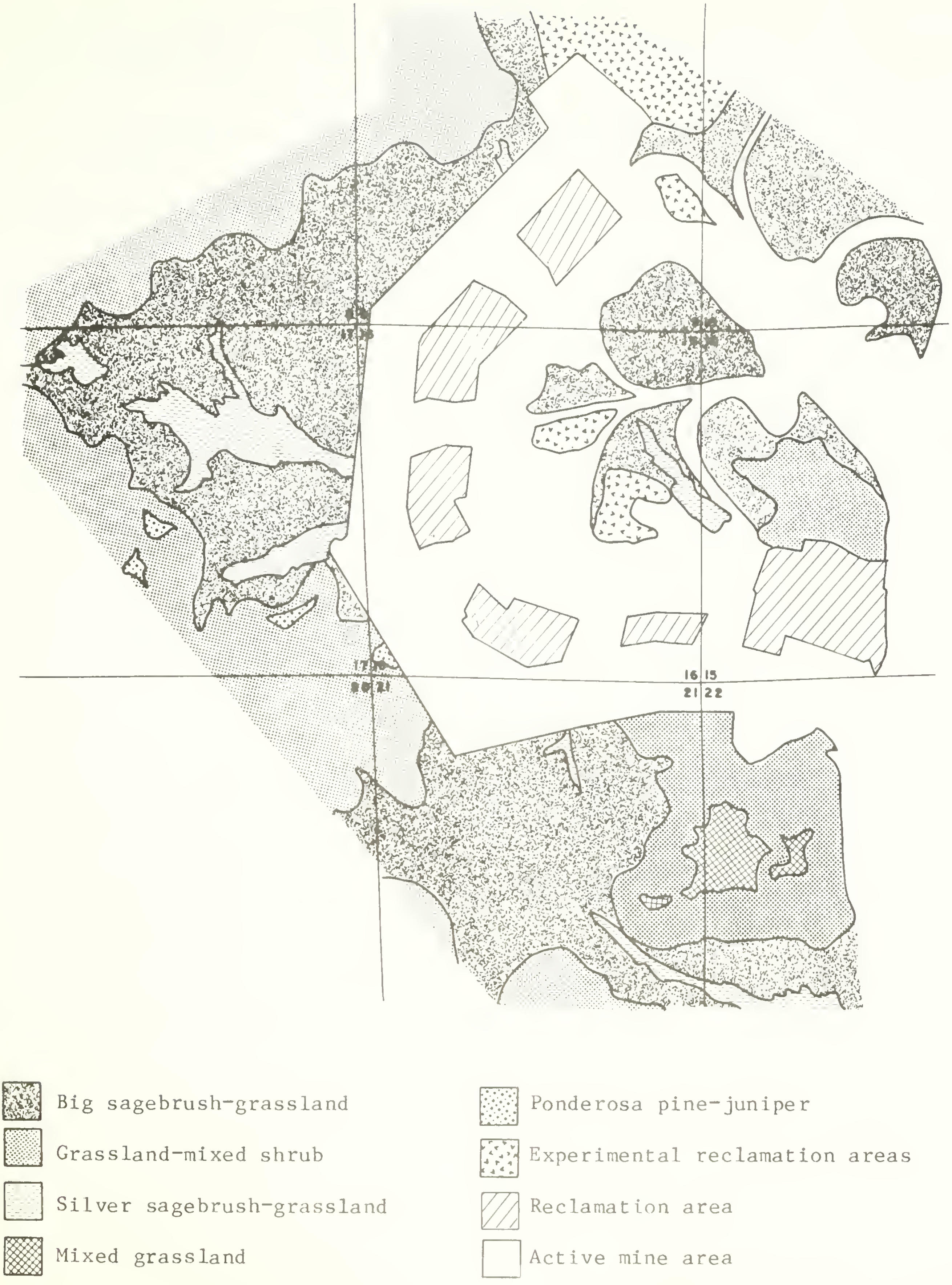


FIGURE II-8.--Vegetation in the Decker area.

TABLE II-8. --Vegetation community characteristics

Description	Soils	Production[1]
Big sagebrush grassland		
Big sage-Western wheatgrass[2]	Keiser silty clay loam Olney fine sandy loam	69.91/40.05
Green needlegrass-Western wheatgrass[3]	McRae loam Keiser silty clay loam	145.24/37.78/33.39
Grassland-mixed shrub[3]	Shingle-Midway-Shale outcrop complex	32.26/20.49/12.84
Silver sagebrush-grassland[4]	Alluvial lands, loamy Terrace escarpments, loamy	126.71/91.89
Mixed grassland[5]	17E-Shingle-Midway complex	81.19/33.74

[1] Production is given in grams per square meter for phenotypes.
[2] Production: perennial grass/big sage.
[3] Production: perennial grass/annual grass/forbs.
[4] Production: perennial grass/shrub.
[5] Production: perennial grass/forb.

4. Mixed Grasslands

The mixed grasslands are characterized by the presence of annual grasses and forbs in association with the dominant perennial grasses. This type is characterized by bluebunch wheatgrass and a high proportion of warm season grasses such as little bluestem and sideoats grama in addition to the western wheatgrasses and needlegrasses. Prairie junegrass and threadleaf sedge are also well represented in this type. Where this community has been disturbed, forbs and annual grasses occur in higher proportions than in other grassland communities. Hood's phlox and whitepoint loco are often the most prominant forbs.

5. Ponderosa Pine-Juniper

Ponderosa pine-juniper communities occur in only a small portion of the permit area. They are usually found on the drier upper slopes in coarse soils.

6. Reclamation

Reclamation has been ongoing at the West Decker mine since 1975. Approximately 243 acres have been reclaimed to date. Wheatgrasses are the dominant species and are intermixed with some introduced species such as smooth brome. Most forbs occurring on the reclamation areas were not seeded. Of those species of forbs present, weedy species, such as the mustards, are prevalent.

G. WILDLIFE

1. Mule Deer

Mule deer populations in this area are primarily determined by the availability of winter habitats. Winter habitat as characterized by north-facing slopes with more dense stands of conifers, providing cover, and by south-facing slopes dominated by juniper or pine and co-dominated by an understory of grasses and shrubs. The majority of deer appear to winter at two sites, one south of the permit area and one to the northwest. A small resident population also occurs within the mine area.

Spring, summer, and fall distribution of mule deer is variable from year to year and a number of diverse habitats are used. Skunkbush sumac receives heavy use in the late summer and early fall.

2. Pronghorn Antelope

As with mule deer, winter range is an important factor in antelope survival. One frequent wintering site, for 60 to 100 antelope, is approximately 2 miles north of the proposed north extension. The area immediately southwest of the permit area is often used by about a dozen antelope. The Pearson Creek and Spring Creek drainages west of FAS 314 are also utilized.

Antelope movements the remainder of the year appear to be variable. However, the data suggest that the drier shrub-grassland vegetation types are the preferred habitat. Frequently the area immediately west and southwest of the present minesite is used during the summer through late fall.

3. White-tailed Deer

White-tailed deer do not appear to utilize the permit area. A limited population of white-tails utilizes the southern end of the Tonque River Reservoir for winter range. Some of these deer remain year-round; others disperse to the Wolf Mountains and as far south as Big Horn, Wyoming.

The major existing impact to big game populations, from mining, has been an increase in poaching and vehicular mortality throughout the area. In addition, the reclamation planting mixture is deficient in shrub species that are necessary for the return of the area to its premining habitat condition.

4. Small Mammals

Deer mice were the most common species of small mammals occuring on permit area. Other species include: pocket mice, harvest mice, white-footed mice, prairie voles, meadow voles, thirteen-lined ground squirrels, and least chipmunks.

Based on comparisons with other grassland studies, it appears that the dominance of deer mice is related to heavy grazing, that is, a decrease in density of grass cover and in perennial grasses (Beckworth, 1954, Phillips, 1936, and Getz, 1961, in the West Decker application, January 1979).

5. Waterfowl and Shorebirds

Waterfowl do not make use of the minesite itself but do utilize the adjacent Tongue River Reservoir, its shoreline, and backwaters. The dominant species include Canada geese, cormorants, great blue herons, a number of duck species, and killdeer. Most migrate south in winter although there are wintering populations of mallards and some gadwals.

6. Raptors

A total of 24 species of raptors either nest, winter, or migrate through the minesite and adjacent area. Osprey, kestral, red-tailed hawks, golden eagles, prairie falcons, and great horned owls nest in the area. Of these, only the kestral nest within the permmit area.

Rough-legged hawks, bald eagles, and an occaisional prairie falcon winter in the Decker area, but not on the minesite.

7. Game Birds

Sage grouse, sharp-tailed grouse, Hungarian partridge, and ring-necked pheasants are the species of game birds in the area. The grouse use the area seasonally, primarily in summer. The closest known sage grouse lek is approximately 2.5 miles southwest of the minesite, and no known sharp-tail leks occur either on or near the minesite.

Pheasant have been observed in the riparian vegetation associated with the Reservoir, River, and backwaters, but no use of the West or

North Decker minesite has been found. Hungarian partridge also do not appear to use the minesite, but a small population does occur to the northwest of the minesite.

8. Songbirds

A total of 117 species of songbirds have been identified in the area. The most abundant are the cliff swallow, western meadowlark, red-winged blackbird, vesper sparrow, lark bunting, and Brewer's blackbirds. House sparrows, starlings, magpies, black-capped chickadees, wrens, robins, kingbirds, and flickers are also common. All use a variety of habitats.

9. Fisheries

No fisheries occur in the permit area. Major fisheries, however, occur in the adjacent Tongue River Reservoir. A detailed description of these fisheries is given in the East Decker and North Extension Mines, final environmental statement (USDI and MDSL, 1977).

10. Endangered Species

No endangered species occur on the permit area.

H. SOCIOLOGY

The Sheridan area is the primary area affected by West Decker activities. Ninety-six percent of the West Decker employees reside in Sheridan County, Wyoming. The mine employees, related basic and ancillary workers, and their families account for 16 percent of Sheridan County's population. Other mining contributes 25 percent and the historical growth trend comprises the remaining 59 percent. By 1990 West Decker's share of induced growth would drop to 13 percent. Other mining would result in increases in the population totaling approximately 14,800 people. 1980 and 1990 population is shown in table II-9.

In rural Sheridan County, the city of Sheridan is the one urban center. "Agriculture is important in the area's economy and lifestyle * * * because of its historical importance as a sustainable economic base and as the dominant land use (about 90 percent of all county land)" (Thompson and others, 1978).

Tourism and recreation have become important elements in the area's economy in recent years. There are a number of museums, historical sites, and landmarks in the area. "All American Indian Days" and the annual

TABLE II-9.--Population growth by cause

Cause	1980 total	Percent of total	1990 total	Percent of total
Historical trend[1]	14,789	59	13,900	42
Other mining[2]	6,202	25	14,800	45
West Decker[2]	3,909	16	4,300	13
Total[2]	24,900	100	33,000	100

[1] McQuiston, 1978.

[2] Adapted from the baseline scenario of the Northern Powder River Basin regional analysis (USDI and MDSL, 1980).

rodeo highlight the summer tourist season. The Big Horn Mountains attract many outdoor recreationists (Thompson and others, 1978).

Located at the base of the Big Horn Mountains, Sheridan is an attractive place with a tradition of low-cost housing and rent. Two-thirds of Sheridan's residents have lived here much or all of their lives. It has traditionally been a conservative town, favored for retirement by many of the rural people of the area (USDI and MDSL, 1977).

Sheridan is the regional shopping center for northeastern Wyoming and southeastern Montana. Coal related development has been extensive enough to help local businessmen, but not so extensive as to attract much competition from chain stores and discount centers. Some businessmen, however, saw potential opportunities for moving up to newly created managerial positions if additional commercial development occurred (USDI and MDSL, 1977).

In 1977 Sheridan County had an estimated population of 21,700, an increase of 21.3 percent from 1970 (U.S Bureau of Census, 1978). In 1976, 63 percent were urban dwellers living in the city of Sheridan. Urban residents were up 22 percent and rural 9 percent. Table II-10 illustrates this growth.

The population of Sheridan County has alternately grown and declined several times since 1900. Sheridan County's population more than tripled between 1930 and 1950 reaching a peak of 16,324 people, due mainly to coal development and to completion of the railroad. Sheridan County's population grew slowly between 1910 and 1920 and decreased during the 1920's, due to much mechanization in the coal mines and dryland farming failures (Thompson and others, 1978).

Between 1930 and 1950, the Sheridan County population increased almost 20 percent. Immigration during the depression and increased job oppor-

TABLE II-10.-- Population characteristics for Sheridan County*

[Source: Thompson and others, 1978]

	1970 actual (percent)	1976 actual (percent)	Percentage increase 1970-76
Population:			
Total county----	17,853	20,800	+17
Urban-----------	10,857 (60.8)	13,200 (63)	+22
Rural-----------	6,996 (39.2)	7,600 (37)	+ 9
Density:			
(per sq. mile)--	7.1	8.2	+15
Sex:			
Male------------	8,886 (49.8)	10,438 (50.4)	+17
Female----------	8,966 (50.2)	10,317 (49.6)	+15
Age:			
Under 5---------	1,095 (6.1)	1,040 (5.0)	- 5
5-14-----------	3,242 (18.2)	2,538 (12.2)	-22
15-24-----------	2,675 (14.9)	3,328 (16.0)	+24
25-54-----------	5,947 (33.3)	7,800 (37.5)	+31
55-64-----------	2,076 (11.6)	2,974 (14.3)	+43
Over 65---------	2,837 (15.9)	3,099 (14.9)	+ 9

*All 1976 population figures are estimates.

tunities in crop and livestock production were the major causes of this growth. From 1950 to 1970 the population slowly declined due to agricultural mechanization and to conversion from coal to other energy sources. The major source of growth today in Sheridan County is the same as it was in the early 1900's-- coal (Thompson and others, 1978).

Sheridan County has a disproportionate number of elderly and persons on low or fixed incomes (USDI and MDSL, 1980). Nearly 15 percent of the county's 1976 population was estimated to be over 65 years of age (Thompson and others, 1978). In a study of Sheridan residents, more than 23 percent of the respondents were retired (USDI and MDSL, 1977). Another 15 percent of the population is in the low-income category (USDI and MDSL, 1979 and 1980).

Sheridan's death rate approximates the birth rate. Natural increase as a growth mechanism is negligible. Of the 3,800 increase from 1970 to 1977, only 100 were due to natural increase (U.S. Bureau of Census, 1978). This is partially attributable to its age composition. Middle-age people, those who bear children and raise families, are relatively few (USDI and

MDSL, 1977). Although the number of persons 65 and over increased from 1970 to 1976, the percent of the total county population they represent has declined. Minorities comprise a minute proportion of the Sheridan County population with 0.6 percent Native Americans (USDI and MDSL, 1977).

About 15 percent of Sheridan's population is in the low income category. The average personal income for the mining industry has increased, in real dollar terms, from $9,173 in 1972 to $14,539 in 1976. During the same period the average personal income in the ancillary sector actually declined form $6,324 to $5,709 in real dollar terms. See chapter II, Economics,table II-12.

Aid to Families with Dependent Children caseloads increased about 50 percent while foodstamp caseloads decreased about 39 percent from 1971-78 (USDI and MDSL, 1979 and 1980). Foodstamp cases are now rising. "On a per person basis, in 1978, a monthly average of 370 persons participated in the program. In 1979, the average was 592, a 62-percent increase" (Sheridan Press, January 17, 1980).

The Decker-Busby Division of Big Horn County is the site of the West Decker mine. The area is sparsley populated with a density of 0.52 persons per square mile in 1976. This low density is approximately one-fourth of the county-wide density of 2 persons per square mile. Approximately 63.5 percent of the population in this part of the county is Native American (U.S. Bureau of Census, 1976). Residents in the immediate vicinity of the mine are largely ranchers and their families. Approximately five West Decker employees list Decker as their address.

A construction camp has been built near the town of Decker, however, it seems to have had little impact on the county. If the proposed new town of Spring Creek is built the characteristics of the area would change (DHES, 1979). There is talk of a settlement at Monument Creek, however little or no planning has been completed. It seems unlikely that two towns could be supported in the area.

I. ECONOMICS

1. Employment

The rate of employment increase in Sheridan County, Wyoming, underwent a dramatic increase following the opening of the West Decker mine in the southeasten panhandle of Big Horn County, Montana, in 1971. The development of the mine was one of the most important sources of employment and income growth during the 1970's in Sheridan County. The mine did not have an appreciable secondary employment impact in Montana.

Between 1960 and 1970 total employment in Sheridan County grew from 6,661 to 6,775, a 1.7 percent increase. Gradually rising real incomes during that period were responsible for the growth in the ancillary sector, as employment in the basic sector declined, mostly because of declines in the agriculture and construction industries. Agriculture has remained, however, as the most important basic industry, representing about 40 percent of the county's 1970 economic base employment, 2,059 jobs (U.S. Department of Commerce, 1975).

Construction began at the West Decker mine in 1971 and coal shipments to the upper mid-west began in August 1972. Both production and employment increased, reaching peaks in 1977 of more than 10.3 million tons and 325 persons, respectively. The development of this mine and the East Decker mine (1976) were the principal reasons for employment growth in the 1970's. Between 1970 and 1976, employment in Sheridan County increased by nearly 40 percent to 9,481 (see table II-11). By 1980 total county employment should be about 12,350.[1] If the mines had not been developed, total county employment would be about 7,335 in 1980 (McQuiston, 1978). The cumulative effects, both direct and indirect, of the growth of the area's coal mining industry are probably about 5,015 jobs or 41 percent of the estimated 1980 total. West Decker is probably responsible for about 1,939 of these jobs or slightly more than a third of the increase.

Most of the Decker related increase (about 1,600 jobs) occurred in the relatively low wage ancillary sector and many jobs were taken by the spouses of the area's primary wage earners and by young people from the area. This has tended to moderate the rate of population growth in the area. The better paying jobs associated with the increase are mostly with the railroad.

Almost all of the West Decker miners live in Sheridan County, and those who do not, shop there. Consequently, there has been no appreciable secondary employment effect in Montana.

2. Income

The Decker mine has made substantial contributions to the total personal income in the Sheridan area. Perhaps as much as 3 percent of the total personal income between 1972 and 1977, and 7 percent of the 1977 personal income (U.S. Department of Commerce, 1978) was a direct result of the mine's payroll. The growth in ancillary sector employment could have been responsible for an additional 10 to 40 percent of the mine's direct contribution.

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[1] The employment estimates were adapted from the baseline scenario of the Northern Powder River Basin regional analysis (USDI and MDSL, 1979 and 1980).

TABLE II-11.--Employment by broad industry and sector, Sheridan County, Wyoming, 1971-76

[Source: U.S. Department of Commerce, 1978]

Type of employment	Year					
	1971[a]	1972[a]	1973[a]	1974[a]	1975[b]	1976[b]
Agriculture[1]	896	896	893	900	874	868
Mining[2]	214	166	98	110	140	161
Manufacturing	386	356	414	356	355	432
Federal government	915	888	842	861	888	963
Construction (part)[3]	26	0	40	189	202	143
TCU[4] (part)[5]	0	0	0	0	0	0
Total economic base sector	2,437	2,306	2,287	2,416	2,459	2,567
Trade	1,497	1,574	1,560	1,614	1,818	1,959
FIRE[6]	205	218	224	239	250	267
Services[7]	1,194	1,267	1,209	1,271	1,312	1,439
Nonfarm proprietors	830	848	863	906	905	911
Construction (remainder)	466	456	481	496	514	540
TCU[4] (remainder)	354	347	418	385	370	367
Local and State government	1,205	1,336	1,415	1,404	1,398	1,431
Total ancillary sector	5,751	6,046	6,170	6,315	6,567	6,914
Total employment	8,188	8,352	8,457	8,731	9,025	9,481

[a] Estimates based on the 1967 Standard Industrial Code.
[b] Estimates based on the 1972 Standard Industrial Code.
[1] Farm proprietors plus farm wage and salary.
[2] Does not include Montana miners who reside in Sheridan County.
[3] Proportion greater than 0.0569 of the total employment.
[4] Transportation, communications, and utilities.
[5] Proportion greater than 0.0571 of total employment.
[6] Finance, insurance, and real estate.
[7] Includes "other" industry wage and salary employees.

Although it is widely believed that the mine's relatively high wage rate has had a positive effect upon the wages received in other industries, the available empirical evidence does not substantiate this position. When the average annual wages by industry are deflated (table II-12) it is clear that no other industry experienced the kind of gains in real income that occurred in the mining industry, which saw a near 60 percent increase in real wages during the 1972-76 period. The average ancillary sector real annual wage decreased nearly 10 percent during the same period.

TABLE II-12.--Average personal income by major industry, 1972-76, Sheridan County, Wyoming, in constant 1967 dollars

[Source: U.S. Department of Commerce, 1978]

	Year				
Industry	1972	1973	1974	1975	1976
Agriculture					
Proprietors	4,354	8,986	2,219	-345	937
Wage and salary	4,090	4,339	4,342	4,509	4,270
Mining	9,173	8,678	13,991	11,743	14,539
Manufacturing	6,986	6,452	6,582	6,642	6,572
Federal government	6,035	6,510	6,391	6,390	6,492
Construction	8,767	9,259	8,387	8,565	7,913
TCU[1]	8,703	9,190	8,601	8,363	9,018
Average[4] economic base	5,707	6,758	5,746	5,326	5,744
Trade	4,887	5,407	5,005	4,747	4,549
FIRE[2]	9,423	8,787	7,303	7,275	7,673
Services[3]	5,170	6,633	5,626	5,718	5,608
Nonfarm proprietors	10,688	9,887	7,171	6,826	6,630
Construction	8,767	9,259	8,387	8,565	7,913
TCU[1]	8,703	9,190	8,601	8,363	9,018
Local and State government	4,380	4,437	4,354	4,491	4,758
Average[4] ancillary sector	6,324	6,732	5,869	5,772	5,709

[1] Transportation, communications, and utilities.

[2] Finance, insurance, and real estate.

[3] Includes "other" industry wage and salary employees.

[4] Averages weighted by proportion of employment.

The effect of the tax payments resulting from the mine operation had some influence upon Montana incomes. For example, other taxpayers in the same property tax jurisdiction as the mine benefitted from the lower tax rate caused by the mine.

3. Taxation

Property taxes account for most of the public revenue in Big Horn County. The State also receives some property tax revenues, but benefits to a much greater extent from the local severence and personal income taxes.

Property taxes are administered by the Montana Department of Revenue under a complex system consisting of an assessment (usually based on market value), a statuatoy taxable value, and mill levies against the taxable value. The State income tax roughly parallels the Federal system

(Montana Agricultural Experiment Station, 1978). Since 1975 three sources of revenue based on the contract sales price of coal have been available in Montana. The contract sales price is defined as the freight-on-board (f.o.b.) mine price, less property, severence, and resource indemnity trust taxes charged to the seller.

The resource indemnity trust tax is an annual tax of $25 plus 0.5 percent of the contract sales price revenue in excess of $5,000 that is received from the sale of minerals, including coal, extracted from the State. Income from the trust account based on this tax will be available to the State for the first time in fiscal year (FY) 1980. The gross-proceeds tax is a property tax that is calculated and distributed as follows: each taxing jurisdiction applies its mill levy against the taxable value of coal, i.e. 45 percent of the contract sales price. The coal severence tax is 30 percent of the contract sales price and is collected by the State and used for a number of activities (table II-13). One of the effects of the mineral taxes is to pass part of the external costs of coal development on to the users of the coal and to compensate future generations for the loss of a nonrenewable resource.

Big Horn County receives most of its revenue from property taxes. For example, in FY 1978, 63 percent of its revenue came from this source. Other important sources of revenue were the severence tax rebate (23 percent) and Federal revenue sharing (6 percent). The remainder came from many different sources including: fees, charges, licenses, permits, fines, and interest. The gross proceeds portion of the county's taxable value was $33,744,583-- more than 62 percent of the total.

Montana elementary and high schools are supported by a complex combination of local, State, and Federal funds. Finances for the general school budget consist of a complex foundation program, a permissive district levy, and a voted district levy. The maximum permissive budget level is established by State statute and varies by enrollment and type of school. It is called the "maximum" level because revenue flowing to it cannot exceed that amount. It is "permissive" because that level can be achieved without a vote. The foundation portion, which is 80 percent of the maximum permissive budget level, is supported by a statutory county levy, by the State equalization fund, and by the State-wide deficiency levy.

The trustees of any schools district may complete the maximum permissive budget by using a permissive levy on the taxable value of property in the district. Each school district may vote a district levy to supplement or enrich the maximum permissive in order to complete the total general budget.

The foundation levy is 25 mills for elementary schools and 15 mills for high schools. The proceeds from this levy remain in the county unless the funds collected exceed the amount required for the 80-percent foundation level, in which case the excess revenue goes into the State equalization fund. Therefore, large increases in taxable value such as those due to mining do not fully benefit the local school districts. The

TABLE II-13.--Disposition of the coal severance tax collection according to 15-35-108,MCA

[Data are in percent of total collection]

	July 1, 1977 to June 30, 1979	July 1,1979 to December 31,1979	January 1,1980 to next change
Constitutional trust fund	25.0	25.0	50.0
General fund	30.0	28.875	19.0
Local impact and education trust fund	19.875	28.125	18.75
Coal area highway improvement	9.75	0.0	0.0
State public school equalization	7.5	7.5	5.0
Alternative energy research, development and demonstration	1.875	1.875	2.5
Renewable resource development bond account (sinking fund)	1.875	1.875	1.25
Parks and art	1.875	3.75	2.5
Producing county	1.5	1.5	0.0
County planning (statewide)	0.75	0.75	0.5
State library commission	0.0	0.75	0.5

State equalization fund, which receives revenue from many different sources, is used to bring revenues up to the foundation level in counties where the foundation levy does not produce the required amount.

The permissive levy may not exceed 9 mills for elementary schools, 6 mills for high schools, or the level necessary to complete the maximum permissive levy (whichever is less). All revenues produced by the permissive levy remain in the school district and in cases where the 9 mill and 6 mill permissive levies fall short in completing the maximum permissive budget an additional State transfer to the school district can be made.

Voted levies (for which there are no statutory limits), in addition to enriching the general school budget, are also the primary source of funds used for capital outlay for school buildings and building sites. Grants from the Montana Coal Board have been made to the Hardin elementary and high schools and to the Lodge Grass high school for capital improvements.

Federal "title programs" also provide supplementary revenues to Big Horn County school districts. Public Law (P.L.) 874 is particularly important and in FY 1976 provided 18.3 percent of the general fund budgets in the county and 28.9 percent in FY 1978 (table II-14.)

TABLE II-14.--Source of school general fund budgets in Big Horn County

[Source: Trustees Financial Summary 1975-76 and 1977-78]

	County total	
	1975-76	1977-78
Receipts from district		
District levies	$ 603,934	$ 395,597
Tuition earnings	3,150	0
Interest	16,576	53,028
Miscellaneous receipts	2,271	16,380
Receipts from county		
County equalization aid	1,605,737	2,096,640
Receipts from State		
State deficiency levy	35,631	0
State equalization aid	175,059	121,390
State impact and bonus payments	0	0
State permissive levy	188,255	152,164
Receipts from Federal		
Federal impact (P.L. 874)	589,230	1,151,153
Total receipts	$3,219,843	$3,986,352

The West Decker mine is located in an elementary school district which has had a very low enrollment (figure II-9). The mine has therefore been subject to very low property tax rates (table II-15.)

Coal mining has been changing the composition of sources of school general funds in Big Horn County. The additional taxable value provided by the coal production has been steadily decreasing the amount of

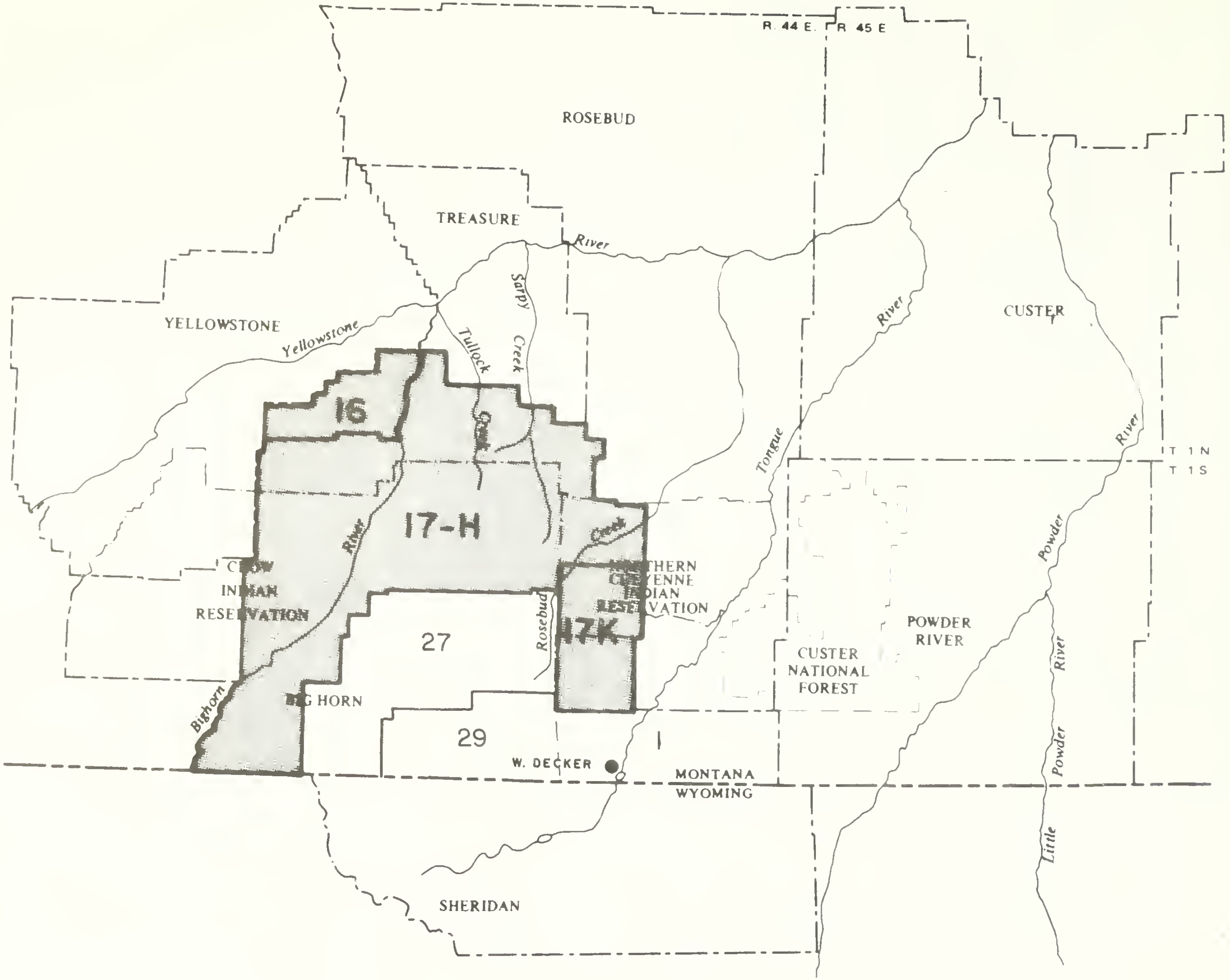


FIGURE II-9.--Big Horn County school districts.

TABLE II-15.-- Comparison of property taxes imposed in Big Horn County School District #1 (SD#1) and State average, 1971

[Source: Montana Department of State Lands, 1979]

	County levy		School levy		City levy[1]		State levy		Special district levy		Total mill levy	
Year	SD#1	State	SD#1	State	SD#1	State	SD#1	State	SD#1	State	SD#1	State[2]
1971-	30.93	40.44	53.71	106.15	-[3]	54.51	8.30	8.30	0	5.52	92.94	106.41
1972-	44.15	43.71	60.33	107.57	-	56.83	6.10	6.10	0	6.18	110.58	163.56
1973-	44.28	45.68	56.12	110.41	-	57.05	6.00	6.00	0	7.06	106.40	169.15
1974-	42.22	46.23	74.70	115.80	-	57.05	9.00	9.00	0	7.06	125.92	178.09
1975-	26.72	42.57	50.59	109.04	-	59.49	6.00	6.00	0	7.37	83.31	164.98
1976-	27.20	43.67	53.03	113.30	-	60.53	5.60	5.60	0	6.49	85.83	169.06
1977-	14.83	44.88	52.59	114.99	-	61.12	6.00	6.00	0	7.40	73.42	173.27
1978-	18.98	45.21	62.58	118.19	-	64.10	5.94	5.94	0	9.33	87.50	178.67
1979-	30.66	44.78	66.84	121.86	-	65.71	6.00	6.00	0.23	9.98	103.73	182.62

[1] Provided for comparison purposes only, is not included in total.
[2] Does not include the average city levy.
[3] Data for School District No. 1 is not applicable.

supplementary State equalization fund aid. In FY 1976, State funds amounted to $398,945 or 12 percent of the total county general school funds. By FY 1978, State aid had declined to $273,554 or 7 percent (table II-14). This trend of increasing reliance upon locally generated revenues has been accompanied by steadily declining average school taxes in the county, from 67 mills in FY 1976 to 58 mills in FY 1978.

Wyoming counties rely upon several sources of revenue. Although property taxes are the principal source, the county's portion of the State sales tax provided a significant part of total revenues. Sheridan County adopted the optional 1 percent sales tax in 1978, raising the tax to 4 percent. The revenues from the Montana mines are not available to help mitigate impacts in Wyoming.

Both the assessed valuation and the mill levy have increased in the past few years in Sheridan County (table II-16). The recent tax rate increase has largely been due to the growth generated by the Decker mines.

TABLE II-16.--Assessed valuation and mill levies in Sheridan County, Wyoming, 1974-78

	1974	1975	1976	1977	1978
Assesed valuation (millions of dollars)--	45.6	47.0	54.2	47.7	84.7
Mill levy--------------------------------	11.5	12.0	12.8	14.14	14.6

School District No. 1 is currently experiencing a serious financial problem. Additionally, the recent construction of two elementary schools has exhausted the district's bonding capacity. The other two school districts in the county are not currently experiencing abnormal fiscal problems.

The city of Sheridan receives revenue primarily from property and sales taxes and from licenses and fees. These sources combine to provide nearly 60 percent of the general fund revenue in FY 1978. Because the city has access to revenues other than property taxes, it has not had the same kind of financial problems as the school district. From 1974 to 1978, assessed valuation in Sheridan increased from $18 million to $23 million and the mill levy was reduced from 12.9 to 10.9 mills (USDI and MDSL, 1980).

The fiscal problems in the Wyoming impact area of the Decker mine would continue as long as most of the employees in the mines in Montana continue to locate in Wyoming.

J. COMMUNITY SERVICES

1. Big Horn County

In southern Big Horn County community services are and have been traditionally limited. The rate of population growth in this part of the county, due to coal mining, has been relatively low, resulting in little impact to community services.

The principal existing impact has been to law enforcement. Coverage of the area by law officers has been limited in the past, partially because of the distance from Decker to the county seat (Hardin). Response time has also been lengthy. Recently the county has assigned, on a rotating basis, one deputy to the Decker area. In the future the county hopes to be able to assign a man permanently to Decker.

The construction phase for the opening of the Spring Creek mine began in spring 1979. In order to alleviate some of the impact to Sheridan County, a construction camp was built near the mouth of Squirrel Creek. Although this camp was designed to be temporary, it is feasible that it could be used by other mines opening in the area. As yet, this construction camp does not appear to pose any major problems for Big Horn County.

The developers of the proposed town of Spring Creek have applied to the State and county for necessary permits and approval and hope to begin construction this spring (1980). If Spring Creek meets all the requirements and regulations and is built, there would be some impact on county services such as law enforcement and medical services, however some of this could be dealt with through the use of Coal Board funds-- an option not available to Sheridan County, Wyoming.

2. Sheridan County

Most of the population growth associated with coal development in southern Big Horn County has occurred in Sheridan County, Wyoming, (chapter II, Sociology). The West Decker mine was first permitted in 1971 and most of the impact to Sheridan County was concentrated in the following 2 to 3 years. West Decker has contributed little additional impact since then. The East Decker mine, permitted in 1977, has contributed the greatest impact to Sheridan, from mining in Montana, since that time. It is uncertain yet what impact the Spring Creek mine will contribute to Sheridan.

The primary problems in Sheridan are fire protection, education, and sewage treatment. The fire department is below state standards and needs to double its personnel as well as to purchase additional equipment. The city school district is at its maximum bonding capacity and although it can handle some additional growth, the special education programs are underfunded. School District No. 1 has added new elementary schools in Big Horn and Ranchester but the capacity of these schools has already been met or exceeded (see chapter II, Economics). The sewage treatment plant is at capacity and is now overloading Goose Creek. The water treatment plant is nearing capacity but the water supply and distribution system can handle additional growth. Further detail is available in the regional analysis (UDSI and MDSL, 1980, volume 1).

The Montana Department of Health and Environmental Sciences has recommended that the town be permitted in the environmental statement released in December 1979. If permitted, there may be a decrease in the existing impacts to community services in Sheridan.

K. LAND USE

The 3,025 acre permit area is currently a minesite, the undisturbed and reclaimed portions of which are used for wildlife habitat and watershed. Prior to the opening of the West Decker mine, the entire area was dominated by ranching, however none of it was used for crop or hayland. In the mined-out portion of the site, 234.7 acres of surface have been reclaimed. Of this, 75 acres have been experimentally grazed in accordance with the Surface Mining Control and Reclamation Act of 1977 and the Montana Strip and Underground Mine Reclamation Act of 1973. The premining stocking rate was 0.15 AUM's/ acre on sites which ranged from fair to good condition (SCS Range Survey, 1973; letter to the Montana Department of State Lands from Decker Coal Company, November 29, 1979).

Within the vicinity of the West Decker mine 7,316.2 acres are also existing minesite (table II-17). The Montana Department of State Lands and the Office of Surface Mining have received applications for an additional 2,477.8 acres to be permitted for mining. Much of the surrounding ranchland has the potential to be mined. This includes the

Squirrel Creek drainage to the south, the Youngs Creek drainage to the southwest, and the Tongue River valley to the north.

TABLE II-17.--Acres of mine land in the Decker area

Mines	Acreage permitted[1]
Existing mines:	
West Decker	3,205.21
East Decker	4,377.7
Spring Creek	2,938.47
Proposed mines[2]:	
Pearl	1,462.0
North Decker	1,015.8

[1] Not all of the permitted acreage would by disrupted by actual mining.

[2] Applications for permits to mine have been received. Other mines are proposed in the area, but no applications have been received.

The Tongue River Recreation area is the major recreational site in the area. The remainder of the Decker area is predominantly ranchland with some pasture and hayland, and, occaisionally, cultivated cropland.

The town of Decker and the Spring Creek construction camp constitute the only urban uses of land in the immediate vicinity. An additional 311 acres would be converted from ranchland to urban uses if the proposed town of Spring Creek is built.

The nearest producing gas and oil field is the Ash Creek field, approximately 8 miles to the west. One abandoned gas well is located within the 5-year permit area (see chapter II, Geology).

Land use in Sheridan County, Wyoming, is a mixture of rural and urban uses. As in southern Big Horn County, ranching dominates in the rural areas with some crop, hay, and pature lands located in the wetter drainages. Many drainages have the potential to become minesites, however mining in norhtern Sheridan County is not yet as extensve as that in Montana.

Land use within the region is described in more detail in the Northern Powder River Basin regional analysis (USDI and MDSL, 1980).

L. TRANSPORTATION

1. Highways

The Decker minesite is accessible from Montana Federal Aid Secondary (FAS) route 314 (figure II-10). Much of this roadway to the mine has recently been resurfaced; the remainder will be completed as the weather allows. North of the Decker mine, a major portion of this route has a gravel surface and to the south of the Montana-Wyoming border this route becomes FAS 338. The Wyoming portion was recently resurfaced and is usually maintained in good condition. FAS 338/314 connects with I-90 and US 87 to the south and to US 212 at Busby, to the north.

In the past FAS 338/314 was primarily a farm-to-market route. Traffic (table II-18) has increased substantillly since 1975-76 due to the opening and expansion of several mines in the area. These mines include the Big Horn mine in Wyoming, and the East Decker, West Decker, and Spring Creek mines in Montana. Several segments of this route are proposed by the State Department of Highways for reconstruction.

2. Railroads and Other Transportation

Burlington Northern (BN) has a 15.9-mile rail spur from the Wyarno area to West Decker. Decker Coal Company has a 1.56-mile spur and loop at the mine which handles about 3 unit trains per day. The East Decker loop also ties into the BN spur and handles another 3 unit trains per day. A new spur and loop are now under construction from the West Decker mine to the Spring Creek mine for use by Spring Creek.

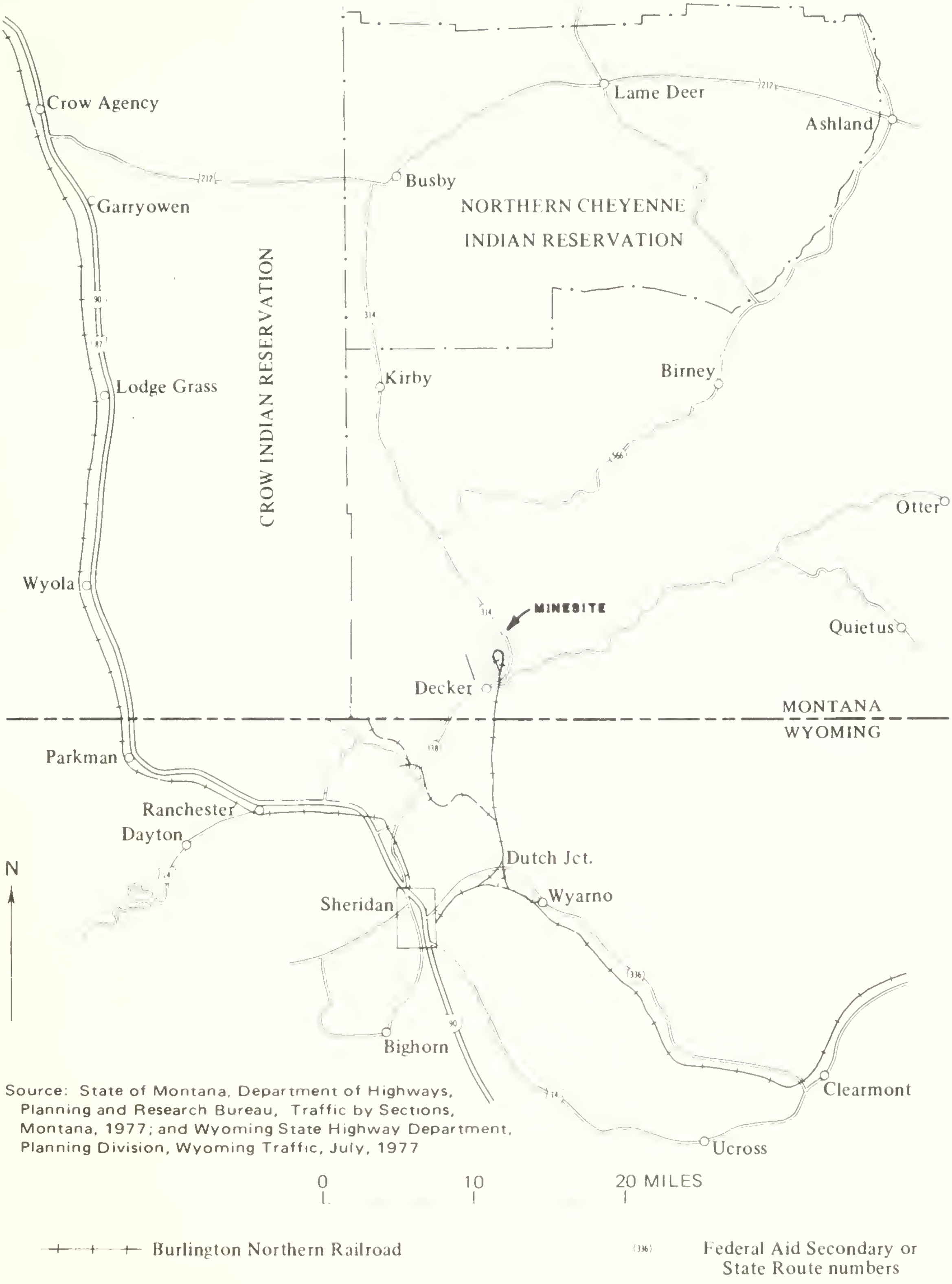
A more detailed description of the highway and rail system is given in the Northern Powder River Basin Coal regional analysis (USDI and MDSL, 1979).

Other transportation available includes bus and air service into Sheridan and has been described in previous environmental statements and in the above-mentioned regional.

M. RECREATION

There are no proposed recreational facilities within the area of the proposed mine extension. The Tongue River Reservoir and the Custer and Big Horn National Forests are the major recreational lands in the vicinity of Decker, Montana, and Sheridan, Wyoming. Recreational opportunities include hunting, fishing, boating, camping, hiking, skiing, picnicking, riding, and driving for pleasure.

A number of well-used recreational facilities are available in Sheridan. These include a swimming pool, tennis courts, a golf course, a



Source: State of Montana, Department of Highways, Planning and Research Bureau, Traffic by Sections, Montana, 1977; and Wyoming State Highway Department, Planning Division, Wyoming Traffic, July, 1977

FIGURE II-10.--Transportation system in the Decker-Sheridan area.

TABLE II-18--Average daily traffic counts for selected road segments in the Decker area

[Source: Montana Department of Highways and the Wyoming State Highway Department[1]]

Road segment	1975	1977	1978/9
Montana:			
314 (Wyoming to the Reservoir)[2]--------	400	500	1,060
314 (Reservoir to the junction of 566)-	293	334	737
314 (junction to Kirby)---------------	62	79	134
314 (Kirby to Busby)-----------------	135	180	184
566 to Ashland------------------------	54	63	117
Interstate (Wyola to Wyoming)----------	1,707	2,134	2,031
Wyoming:			
338 to Montana------------------------	400	500	1,110
Interstate (Montana to Parkman)--------	1,636	1,816	2,055
Interstate (Ranchester to Sheridan)----	2,997	3,207	3,940

[1] The 1979 data is the most recent data available in Montana; 1978 data is the most recent available in Wyoming.

[2] The 1975 and 1977 figures for this segement are approximations based on adjacent road segment data.

gymnasium, an ice skating rink, parks, playgrounds, ball fields, a zoo, the YMCA, a civic center, and some historic sites. Use of these facilities appears to be at or above capacity, in spite of the fact that many, such as some of the parks and playgrounds, are underdeveloped and/or poorly maintained (Meadowlark, 1978).

N. CULTURAL RESOURCES

The entire area the company proposes to mine has been surveyed for cultural resources. Two sites have been identified adjacent to the area. One of these, the Cox Fortification site, has the potential for nomination to the National Register (Fredlund, 1977). The other, the Buzzard Point site, is not of National Register quality. Decker Coal Company has received clearance from the State Historic Preservation Office for the disturbance of the mine area.

O. AESTHETICS

The area of the proposed mine extension is primarily rolling bench land terminating in low-lying hills. It is visually similar to many other areas in the region. The exception is the existing minesite-- an industrial complex imposed on a rural setting. Two gray weathered shale outcrops form the only distinguishing features within the proposed permit area. Such outcrops occur elsewhere in the region.

To the east lies the Tongue River Reservoir and to the south and west lie the Big Horn Mountains-- the dominant visual features from the permit area.

Mining has had a major influence on the aesthetics of the permit area, contributing both audible and visual impacts. Haul roads, blasting, facilities, and heavy equipment all contribute to a reduction in the aesthetic qualities of the area. This is compounded by the presence of the East Decker on the eastern shore of the Reservoir.

CHAPTER III

IMPACTS OF THE PROPOSED MINE AND RECLAMATION PLAN

A. GEOLOGY

1. Summary

Portions of the reduced highwall would probably be susceptible to severe erosion problems caused by sheetwash, piping, mass failure, and gullying, and sediment accumulation.

The steepness of the 3:1 highwall (33 percent slope) is the most important variable in the stability of the highwall. The company plans to resurface the reduced highwall with 19-20 inches of soils dominated by sandy-loams. Sheetwash on these soils would be excessive. Research in North Dakota indicates that 300 tons/acre/year or more of sediment could be expected from the sheetwash erosion of bare 3:1 slopes (USDA and the N. Dakota Agricultural Experiment Station, 1977). Mulching all slopes, as proposed, would reduce erosion substantially, possibly to 20 to 40 tons/acre/year. Although excessive, 40 tons/acre/year is not uncommom on heavily grazed areas of Montana and Wyoming.

2. Topography and Geomorphology

A cyclic relationship exists between vegetative cover and erosion. High erosion rates affect vegetative success but vegetative cover and root density are, in turn, an important variable affecting erosion rates. As mulch loses its effectiveness, potential erosion rates from the highwall could remain excessive if revegetation efforts were to be unsuccessful (Power Reis, and Sandoval, 1978; Schafer and others, 1979). If a fairly dense vegetative cover developed on the highwall areas, the erosion rates could drop to moderate to low levels.

Magnitude, frequency, and seasonality of the precipitation affect the success of the revegetation efforts and in turn affect erosion rates. Excessive or minimal precipitation could adversely affect the success of reclaiming the highwall from both a vegetative and erosive standpoint.

Sandy soils appear especially susceptible to rills and gullying (Observed at the Rosebud and Big Sky mines in Rosebud County). Since sandy-loams make up about three-quarters of the salvageable exterior soils, rills and gullying would probably be a fairly significant problem on the reduced highwalls.

The spoils, which are highly sodic and dominated by smectites, would be highly impermeable (see chapter III, Geology: Overburden) and would create a barrier to the downward percolation of water from the topsoil. On steeper slopes, particularly the reduced highwall, water would collect and move downslope along the spoil-soil interface picking up soil grains and creating voids. These voids may eventually interconnect to form subsurface channels or conduits, called "pipes," which can cause caving and gullying. Piping occurs extensively on materials with high sodium absorption ratios (SAR = 30 (USDA and N. Dakota Agricultural Experiment Station, 1977). Piping, however, is somewhat unpredictable and methods are needed to evaluate the nature and occurrence of piping. The West Decker area has very similar conditions as those studies in North Dakota (see chapter II, Soils and Geology). Piping would probably be a problem at West Decker, particularly on the steep highwall slopes. The impermeable nature of the spoils also increases the likelihood of slumping or soil creep developing as water collects at the soil-spoil interface, especially on the reduced highwalls.

In summary, the steep reduced highwalls would probably be geomorphically unstable. The highwalls, however, would have a complex shape: convex upper slope, a straight midsection, and a concave lower slope. This configuration has been found to be the most stable for slopes in excess of roughly 100 feet (Wischmeier and Meyer, 1973); thus the highwall slopes should be more stable than a long uniform slope. The bond[1] placed on these areas prior to mining would not be released until the highwalls were stable and the revegetation were comparable to preminng conditions.

The 7:1 interior slopes[2] of the two drainages may also initially be unstable, although less so than the regraded highwall. Moderate to high levels of increased surface erosion may occur before vegetation becomes well established (Power, Ries, and Sandoval, 1978; Schafer and others, 1979). Once vegetation is established, the erosion potential would probably be only slightly to moderately accelerated (Lusby and Toy, 1976). Erosion rates, however, would probably still be much higher than erosion rates on similar undisturbed slopes (minimal erosion).

Sediment carried by runoff from the reduced highwalls and the interior slopes would be deposited in drainages at the base of the reduced highwalls. Excessive sediment accumulation in the drainages would adversely affect the vegetation and the geomorphic stability of the drainages themselves.

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[1] Bond is required under the Montana Strip and Underground Mine and Reclamation Act of 1973 and the Surface Mine Control and Reclamation Act of 1977 to enable State and Federal agencies to reclaim an area should a company decide to default.

[2] Those slopes of the drainage located closest to the mine interior (see figure I-5).

During mining and for at least 10 years following reclamation, retention ponds would remain in place to capture runoff and sediment from the reclaimed areas, thereby limiting any adverse effects to the mine area. When the reclamation is stable, bond would be released and the retention ponds would be removed, allowing the system to act naturally on its own.

The postmining topography of the Pond Creek drainage would be more subdued than the premining topography. Duplication of the original contours would be difficult and slopes could be unstable. Bond would not be released until these slopes stabilized. Parts of the inner mine have been reclaimed and dictate elevations that must now be worked around. This precludes future reclamation from more closely approximating the original topography (unless existing reclamation were to be reworked-a more disruptive option).

The final pit would be filled in along the western end of the mine at the head of Pond Creek (figure I-8), but a materials deficit would leave two drainages at the base of the highwall. The postmining topography would in part assume the horseshoe shape of the West Decker mine (see chapter III, Aesthetics).

The addition of the short-term BLM leases to the northwest would make reclamation somewhat easier by allowing the mining of higher overburden areas, thus increasing the amount of spoil available for reconstruction of the topography. The inclusion of the southwestern most leases would also allow the company to blend the reclaimed surface more naturally with the existing topography by extending reclamation into a natural saddle to the southwest (figure I-8). Without these leases, the postmining topography would be less stable and erosion problems would be encountered where natural drainages intersected the reclaimed highwall. As such, the probability of success would be decreased.

3. Stratigraphy

The stratigraphy within the mine pit would be irretrievably destroyed, however this destruction would not significantly impact the actual strata. The strata have neither special or unique qualities nor intrinsic value. Discrete horizontal strata would be replaced with a mixture of broken, loose rock, resulting in the loss of the confined coal aquifers, degradation of the water quality, and the placement of sodic overburden very near the surface (see chapter III, Hydrology, and Soils).

4. Paleontology

Mining at West Decker should have minimal impact on paleontological resources. No known paleontological resources of importance have been found at West Decker and the potential for important finds in this area is low.

5. Minerals Other Than Coal

Mineral resources other than coal at West Decker would not be significantly affected by mining.

Two abandoned gas wells are located within the permit area. The company is working with the Montana Board of the Oil and Gas Commission on procedures for effectively capping these wells. Mining should not preclude development of oil or natural gas from lower strata if discovered.

6. Overburden

Although no problems are apparent, the overburden spoil could have significant impacts on the topsoil and reclamation success of the mined area in the future. This could result in reduced vegetative growth over portions of the reclaimed surface, and a possibility of small areas which would support little or no vegetation. (See chapter III, Soils).

The primary cause for the potential of reduced reclamation success would be the translocation or upward migration of sodium from the sodic overburden into the reapplied topsoil. Sodium adversely affects the physical properties of soils causing a reduction in soil pore space and in air and water availability; an increase in density and mechanical resistance to root growth; and a crusting of the soil surfaces (see chapter III, Soils) (USDA and N. Dakota Agricultural Experiment Station, 1977).

The fine-textured, smectite-dominated overburden, once disturbed and regraded, has very low permeability rates. If allowed to dry, temporary cracks develop. Upon re-wetting, the cracks are closed by the swelling clays, reestablishing the impermeable seal. The result is a maximum of one leaching event per year. Leaching is likely to be less frequent and would be inadequate to remove sodium and other salts from the surface area of the regraded spoils.

The translocation of sodium and other salts is most likely to occur during periods of average (12 inches/year) and below average precipitation. Precipitation, since reclamation was initiated at West Decker, has been significantly above average for most years (chapter II, Climate) including several of the wetter years on record. The potential influence of the regraded overburden spoils in the soil resource is further discussed in Soils, chapter III.

The slightly elevated molybdenum levels noted in chapter II are not expected to have any adverse effects. The levels are lower than those found at other mines in the Northern Powder River Basin. In addition, excess molybdenum primarily affects legumes which are not expected to be a major component of the reclamation vegetation.

Nickel values exceed State suspect levels by a substantial margin. Recently published (Underwood, 1977) reviews of nickel toxicity studies on humans and animals indicate that the metal is considerably less toxic than initially suspected. The effect of nickel on vegetation, and the uptake of nickel by plants needs clarification (see chapter III, Vegetation).

The single best method of disposing of the sodic overburden would be to cover it with more acceptable overburden material to a depth of 8 feet. This solution is impractical due to the almost complete absence of acceptable overburden on the minesite.

B. HYDROLOGY

1. Summary

Mining at West Decker would not significantly affect the hydrologic system of the Decker area as a whole. Moderate changes would probably occur in the mine area's ground and surface water systems. Several shallow domestic and stock ground water wells adjacent to the mine area would probably be lost as the mine advances. Ground water within the mine area itself would probably be of poor quality, unsuitable for either stock or domestic use, but deeper aquifers could be tapped to replace lost ground water.

After reclamation surface water at West Decker would decrease in quality for the short term as sediment load and total dissolved solids increased. This decrease in water quality probably would not adversely impact the Tongue River Reservoir since the volume would be small. Postmining land uses should not be limited by surface water availability as aquifers exist that could supply adequate water.

2. Ground Water

Mining should not have any significant irreversible or irretrievable effects on the ground water system of this area. The ground water levels in the Anderson-Dietz 1 and Dietz 2 aquifers have been lowered, due to mining, up to 2 miles from the mine pit. As the mine continues to expand ground water levels would continue to decline. As such, four wells near the community of Decker would probably be lost. Mining the Dietz 3 coal seam in the interior area will cause an additional drop on the ground water level of both the Anderson-Dietz 1 and Dietz 2 aquifers (oral communication, Van Voast, 1980).

Mining would also destroy seven observation wells, a windmill, and a water tank located within the 5-year permit area. Wells that could potentially contaminate ground water, if mined through, must be properly plugged. The company stated that they would replace lost wells wherever required by the regulatory agency (Montana Department of State Lands). Deeper aquifers, primarily the Dietz 3, Dietz 4 and Dietz 5 coal seams, have adequate useable supplies of water that could be tapped.

After reclamation, ground water levels would rise in the spoils, adjusting to the elevation of the Reservoir, the incoming water from the coal aquifers, and the Pond Creek alluvial aquifer, and would once again flow towards the Reservoir. Mine spoils would probably be as transmissive as the aquifers they replaced and therefore probably would not retard ground water movements (Van Voast and others, 1978). Ground water moving through the spoils probably would pick up chemical impurities and become poor in quality (6,000-10,000 total dissolved solids), unuseable for human or agricultural purposes (Van Voast and Hedges, 1975; Van Voast, oral communication, January 1980). Calcium, magnesium, sodium, sulfate, and total dissolved solids would probably be substantially higher than in nearby aquifers. The water quality of the Tongue River Reservoir should not be appreciably altered by this influx of spoil however, because water since the amount is small, only 0.02 percent of the Reservoir inflow (Van Voast and Hedges, 1975).

Cumulative impacts on ground water levels from North and West Decker should not be significant (Van Voast and Hedges, 1975). It is also unlikely that ground water quality in the region would be significantly affected by the mining of both West Decker and the North Extension.

3. Surface Water

Initially. runoff would be of lower quality than that from native range, and would contain more total suspended sediments. Runoff rates would probably increase moderately (0-4 times native range) on the reclaimed surfaces (Lusby and Toy, 1976), increasing erosion to moderate to severe levels (see chapter III, Geology, Geomorphology). Mercury problems in the Tongue River Reservoir, as identified in chapter II, would not be aggravated by mining activities at West Decker or other mines in the area.

Runoff from all disturbed areas is detained in retention ponds for a minimum of 24 hours for events up to a 10-year, 24-hour intensity. The retention ponds cannot be removed until sediment yields return to acceptable levels. As such, impacts of degraded water quality from the West Decker area would be confined to the permit area under normal conditions. When runoff and water quality return to normal, bond would be released.

For storm events greater than the 10-year, 24-hour design capacity of the retention ponds, runoff would enter the Tongue River Reservoir slightly decreasing the water quality in the reservoir near the Pond and Pearson Creek outflows. This degradation should be temporary and of minimal effect.

The reduced highwalls would have a moderate to high probabilty of being geomorphically unstable (see chapter III, Geology, Geomorphology). Should this occur, the instability would cause runoff and water quality problems in the two drainages capturing runoff from these areas. Sediment would accumulate, possibly creating artificial impoundments. Until these areas stabilized, bond could not be released.

Following reclamation Pond Creek would flow at approximately the same gradient and location as it had before mining. The flood plain would be 200 feet wide and should be capable of passing the estimated runoff of 1,600 cubic feet per second created by a 100-year 6-hour event. Other minor reclaimed drainages appear to be capable of passing the storm runoff from a similar sized event. Natural armoring of the channel by pebbles and gravel would not develop for a very long time. Vegetative cover is essential to the geomorphic stability of the drainages (see chapter I, table I-5).

Mining would destroy 3 impoundments that existed prior to 1966 and 6 impoundments added since then for stock watering and runoff control purposes. Decker does not plan to leave any impoundments once bond release is approved. This area would be short of year-round watering sites once the impoundments are removed.

C. CLIMATE

Little or no impacts are expected to climate due to mining at West Decker. The regional, however, describes the potential cumulative, long-term impacts to climate (USDI and MDSL, 1979).

D. AIR QUALITY

There would be no additional impacts to air quality. Particulate and gaseous emissions and TSP concentrations would remain virtually identical to those discussed in Air Quality, chapter II because there would be little or no change in the present production rate.

E. SOILS

1. Summary

The regraded, topsoiled mined lands could be subject to adverse impacts caused by the movement of sodium from the sodic overburden into the topsoil. This would most likely occur along the toe slopes, in depressions and along drainages, where lateral flow of water along the soil-spoil interface would concentrate. Salts other than sodium might also be concentrated. Degradation by sodium translocation would probably not occur in the upper and mid-slope areas. (S.D. Merrill, Northern Great Plains Research Center, Mandan, N.D., oral communication). To date, this has not been observed on any West Decker reclamation surface (Table III-1), but could develop over a period of years.

2. Discussion

Accumulations of sodium and other salts could occur as the reclaimed areas increase in size and develop complete drainage basins. Over most of the area very moderate (<4 percent) slopes dominate; this minimizes problems of sodium and salt accumulation. Areas adjacent to the reduced highwall on the northwest and the southern boundaries (figure I-8) would be most susceptible to this process. These areas would not be graded and topsoiled until the late 1990's. The problem, if it developed, might not be readily apparent until after the required 10-year bonding period has elapsed.

Upward movement of sodium in the replaced soils at West Decker has not been demonstrated to date. Samples taken in October 1979 by the Office of Surface Mining can be interpreted to show that sodium and other salts have been moved downwards (table III-1). In the absence of baseline data, the findings cannot be considered conclusive, but it is reasonable to conclude that soils placed on regraded spoils in 1975-1977 have been actively leached. Precipitation at Decker, Montana, in 1977 and 1978 was well above average (18.7, 17.4 inches respectively versus an average of 12.4), supporting this conclusion. Precipitation in 1979, however, dropped to 10.3 inches. The soils placed in the fall of 1978 have elevated salt levels (EC) and sodium (SAR) values, presumably reflecting the initial condition of the soil. Subsequent sampling here and elsewhere would clarify the relationship between soils, spoils, and precipitation levels.

The likelihood of upward translocation of sodium from the overburden into the soil is not well defined. The movement of sodium is dependent to a large degree on the permeability of the underlying spoils, and their ability to release water to the soils (S.D. Merrill, personal communication). During a period of average or below average precipitation the surface soils dry out and water available in the subsoils is drawn towards the surface. Only if water is available in the spoil and subsoil will it and the sodium dissolved in it be moved upwards. Not enough information is presently available to form a well documented prognosis.

Other impacts to the soil resource result from practices which pre-date the legal requirements for maximum topsoil salvage. Soils on the reclaimed surface will be substantially more shallow than the average depth in the area to be mined (20 inches versus 32 inches). This results from relatively little soil salvage during the initial phases of mining in the early 1970's. Total calculated soil resources in areas to be mined and in storage piles amounts to 3,838.6 acre-feet.

The total area which will require topsoiling is 2,350.8 acres. Topsoil depth would therefore be approximately 1.6 feet (19.6 inches). The reduction in average depth would reduce plant available water and be less of a buffer between the rooting zone and the sodic overburden.

TABLE III-1.--Selected soil characteristics of samples taken in replaced topsoils in West Decker's reclamation Area E

Year	Depth[1]	Texture	pH	SAR[2]	ESP[3]	EC[4]	CEC[5]
1975---	A	Loam	7.8	3.4	3.4	0.8	19.4
	B	Sandy loam	7.5	9.4	8.1	5.1	15.5
	C	Silty clay	8.1	22.1	22.6	5.6	18.2
1975---	A	Sandy clay loam	7.7	4.3	5.4	0.8	19.4
	B	Clay	7.8	7.5	9.5	3.6	24.2
	C	Silty clay loam	8.2	27.2	28.6	6.3	21.2
1976---	A	Clay loam	8.0	8.2	9.8	2.8	26.5
	B	Clay loam	7.7	10.2	8.9	5.2	24.0
	C	Silty clay	7.9	19.9	15.3	7.1	19.8
1976---	A	Clay	7.8	4.2	4.2	1.6	26.1
	B	Clay	7.5	6.5	7.7	5.6	30.5
	C	Silty clay	7.8	17.0	15.3	6.4	19.8
1977---	A	Clay loam	7.7	5.3	6.5	1.9	20.7
	B	Loam	7.7	8.7	10.3	3.8	18.2
	C	Sandy clay loam	7.5	6.0	7.7	3.1	21.0
1977---	A	Clay loam	8.1	9.7	11.7	1.5	16.3
	B	Sandy clay loam	8.0	9.7	12.2	1.9	18.3
	C	Silty clay	8.0	17.4	17.1	6.4	18.9
1978---	A	Clay loam	7.5	5.2	6.7	5.0	23.8
	B	Clay loam	7.5	6.5	8.2	4.3	22.9
	C	Silty clay	8.0	19.2	23.0	5.0	18.7
1978---	A	Clay loam	7.8	8.5	11.0	7.4	21.2
	B	Clay	7.9	13.8	8.5	8.4	22.4
	C	Silty clay	8.0	21.9	20.2	6.7	19.7

[1] A equals 6 to 9 inches in replaced topsoil, B equals 12 to 15 inches in replaced topsoil, and C equals 3 to 8 inches in regraded spoil.

[2] Sodium absorption ratio (State suspect level: 12).

[3] Exchangeable sodium percentage (no established State suspect level).

[4] Electrical conductivity (salinity), in mmhos/cm (State suspect level: 4-6 mmhos/cm).

[5] Cation exchange capacity in milliequivalents per 100 grams of soil (no established State suspect level).

Actual topsoil salvage would probably be increased slightly over the projected figures. The company samples soils just prior to salvage rather than relying on more general surveys; this enables the company to salvage all available suitable material.

The soils are also subject to a range of unavoidable impacts resulting from salvage, storage, and replacement on the regraded spoils. These include a loss of soil structure (become massive), reduced organic matter, increased density, and a decrease in soil pore spaces. The net result is reduced infiltration rates, greater runoff and erosion rates, greater resistance to root extension, and a slight (0-20 percent) reduction in plant growth potential. Susceptibility to drought is increased. The impact is greater on finer textured soils. The soils found on the exterior of the current mine-cut are predominantly sandy loams, while those in the interior are finer textured, predominantly clay loams, sandy clay loams and occasionally clays. Approximately 76 percent of the salvageable soils are located in the exterior where the soils are best suited for salvage.

Soils on the reclaimed surfaces are less resilient than those on undisturbed natural range sites. As a result, they will be more susceptible to poor management practices. State and Federal regulations require a minimum 2-year grazing trial prior to bond release, which would establish whether the reclaimed land could accept use at levels which are considered good grazing practices for native range. This point is more fully discussed in the Northern Powder Basin Regional EIS (USDI and MDSL, 1979).

F. VEGETATION

1. Summary

Impacts to vegetation could be significant in the short term, in that the existing vegetation would be completely removed. Following reclamation there may be long-term impacts associated with the soil conditions, climate, and lack of species and structural diversity. Until the reclaimed vegetation is similar to that which existed prior to mining, there may be a decrease in the carrying capacity for wildlife; there may or may not be an effect on livestock carrying capacity. Bond could not be released until the reclamation was successful.

2. Discussion

The revegetation at Decker may be affected by overburden and soils conditions (see chapters II and III, Geology (Overburden) and Soils). Both nickel, and sodium and salts levels in the overburden have the potential to cause problems. Few species are able to tolerate high levels of sodium and salts such as occur in portions of the overburden at West Decker. If saline or sodic conditions do develop, the species diversity would remain quite low and the wildlife carrying capacity would be permanently reduced. If saline or sodic conditions do not develop, the reclaimed surface, under proper management, should be able to reach the stage where it resembles the premining plant communities.

If nickel is absorbed in sufficient quantities by plants, from the overburden, there may be a decrease in productivity or a decrease in species diversity. Little is known about the uptake of nickel by vegetation and at what levels nickel becomes toxic (Chapman, 1966).

The effect of climate on revegetative success is not entirely known. Several areas in eastern Montana, including one at West Decker, had to be reseeded due to a seeding failure in the spring of 1979; it was caused by an extremely dry spring. There was not a noticeable effect on those sites which have been reclaimed for several years; however, the effect of several successive years of drought on the revegetated areas has not yet been experienced. The effect would most certainly be detrimental, as it would be to native range, however the degree and duration of the effect are not known. Those sites which have been reclaimed for 2 or more years have developed under above-normal precipitation.

Species diversity on the reclaimed surface would initially be quite low. Although deer mice, antelope, and fox are known to use the reclamation areas, the overall wildlife carrying capacity for all species would be reduced. The total number of different species is only one aspect of diversity. The quantity of each is also important. Reclamation, to date, is more diverse, in numbers of species, than the seed mix used onsite. However, there are few individuals of each species and the reclaimed areas do not yet meet the criteria for bond release. Total diversity, to date, on the reclaimed surfaces remains below the premining levels.

The diversity of the revegetated areas could be increased by increasing the number of shrub and forb species included in the seed mix. This would both benefit wildlife and decrease the susceptibility of the vegetative cover to drought.

Plant productivity appears to initially be high but could be expected to decrease as nutrients become bound, in an unavailable form, in the accumulating plant litter. Productivity for the long term is, as yet, unknown.

Secondary impacts to vegetation, primarily due to dust accumulation, are described in the Absaloka Mine final environmental statement (DSL, 1979) (chapter III) and the regional analyses, chapter IV (USDI and MDSL 1980, volume I).

G. WILDLIFE

1. Mule Deer

Permitting the extension of the West Decker mine would not have a major impact on mule deer populations. However, mining in general would impact the mule deer population if the winter ranges to the south and northwest of the permit area were disturbed either physically or by the increased activity. The small resident herd within the mine would probably shift either to another area of the mine or join one of the herds in the adjacent area.

Long-term impacts to mule deer would occur because the reclaimed areas, under the proposal submitted by the company, would not be seeded with many browse species.

2. Pronghorn Antelope

Impacts to antelope should not be significant; however, a lack of xerophytic shrubs in the seed mixture could result in the long-term reduction of the amount of available range.

3. White-tailed Deer

White-tailed deer are not expected to be impacted by the extension of mining because at present they make little or no use of the permit area.

4. Small Mammals

Fluctuations in numbers and distribution of small mammals could be expected as a result of the extension of mining.

The overall impact, however, should be small and little impact is expected in terms of the total prey base available to raptors and other predators. As habitat is lost to mining, habitat would be created by reclamation.

5. Waterfowl, Shorebirds, Raptors, Game Birds, and Songbirds

Waterfowl and shorebirds are not expected to be impacted by mining. Game birds would probably be affected due to the reduction in shrub habitat, however, it is unlikely the effect would be great as no leks occur within or immediately adjacent to the permit area.

Raptors may be affected by a slight, temporary reduction in prey base.

Some songbirds would be disrupted by the loss and subsequent change in habitat, as the reclaimed areas would be predominantly grassland.

6. Fisheries

The extension of mining is not expected to have an impact on the fisheries of the Tongue River Reservoir because the quantity and quality of the waters released from the permit area is controlled.

7. Endangered Species

There are no known threatened or endangered species within the permit area.

H. SOCIOLOGY

1. Summary

The granting of a five-year permit to West Decker would contribute to the continuation of existing mine-induced social impacts in the southeastern panhandle of Montana's Big Horn County and in Sheridan County, Wyoming. It would also further the decline of Sheridan as a retirement community.

2. Discussion

The most serious impact of the five-year permit would be on the poor and elderly of Sheridan County. The elderly and those on low incomes would continue to suffer from housing shortages and inflation. The continued operation of West Decker would add to these problems, although they would exist to some degree with other coal development in the area.

The increase in consumer demand has caused local inflation, the overcrowding of services (especially medical), higher rents, and costs of basic necessities. (USDI and MDSL, 1980). Thus, senior citizens, especially, would be at a disadvantage in the competition for housing; those who rent may have to look to the city and county for assistance (USDI and MDSL, 1977), and "Those on fixed incomes in Sheridan County will be at a competitive disadvantage with highly paid miners for goods and services, particularly housing" (Gold, 1975).

> "Low income families differ from those on fixed incomes in that they may expect their opportunities to improve with changing circumstances. Even if their absolute income increases, they may be less happy and satisfied with their economic situation because of relative

> deprivation. Relative deprivation occurs when actual achievement compares unfavorably with achievement of others sharing similar characteristics and environment. Thus, if low income families anticipate an improved status with the promise of economic growth and it fails to materialize because the social and economic position of others in the community has risen proportionately, the social dissatisfaction in this position could actually rise." (Thompson and others, 1978).

If present income trends continue, as discussed in chapter II, then so will feelings of relative deprevation. Evidence for the phenomenon occurring in Sheridan County is found in chapter II, Economics, table II-16.

The mining work force has changed the composition of the communities' population and places different demands on community services. (Thompson and others, 1978). This altered population will continue to make demands on the services of Sheridan County throughout the life of the mine.

Social impacts depend in part on the ability of local governments to plan for growth and to provide social and physical services for an increasing population. There are indications that Sheridan has had difficulty anticipating and meeting these needs. Sheridan appears to lack a commitment to policies of growth management (USDI and MDSL, 1980).

The population of Sheridan County would increase some due to continued mining at West Decker. By 1990 the mine would account for 13 percent of the total county population, approximately 391 people (table II-14). This growth represents not only West Decker employees and their families; but includes growth in other basic sectors and the ancillary sector, as a result of the West Decker employees.

Community characteristics in the county are changing. "The attributes which make Sheridan County an attractive retirement community may be qualitatively altered" (Thompson and others, 1978). Sheridan is "now in the early stages of changing from a haven for retired ranchers and farmers to a place where it will be increasingly difficult for older people to enjoy the controlled, relaxed, and rural-service-town atmosphere. This had been its main attraction before the towns recent growth cycle. Sheridan would become bigger, more urbanized, more impersonal, and more expensive; retired people would tend to settle elsewhere; and natural attrition would further reduce the number of Sheridan's senior citizens." (Gold in USDI and MDSL, 1977).

Many of these changes are already occurring and additional growth would continue to change the character of Sheridan County. The area could decline as a recreation and tourist hub if it loses its "Old West" flavor. Observation over time would be required to determine the extent and possible impact of this.

According to a survey conducted by the Institute for Social Research, the people of Sheridan had difficulty separating the past or future impact of Decker from that of other coal companies (USDI and MDSL, 1977). Additional knowledge of social units in Sheridan County would allow better predictions of impacts related to West Decker. The same survey stated that "34 percent [of the respondents] said that the company's principal effect on the town has been economically beneficial, 37 percent said that its principal effect has been to increase rents and living costs. Overall, however, people in Sheridan have a positive feeling toward Decker Coal Co., and 52 percent would definitely not oppose the proposed mine expansion." If these same feelings persist today the same percent would likely not oppose the continued operation of the West Decker mine.

The panhandle of Big Horn County would not gain noticeable population because the mine has stabilized and additional ancillary growth would occur in Sheridan County. Ninety-six percent of West Decker's employees live in Sheridan County and those who don't will continue to rely on Sheridan for the goods and services they require.[3]

However this area may also experience a change in character and way of life. A survey of ranchers in the Decker area indicated that "Although the coal issue has sharply divided some areas, some ranchers are making a real effort to keep alive the old social relationships, i.e., the old neighboring and helping patterns. Those people felt that these personal relationships, which have been nurtured in the past, have kept communities together in hard times. One individual said that in previous times of crisis her community had always drawn closer together, thus gaining strength to meet the challenge. Now, she said, the coal issue is tearing the community asunder" (USDI and MDSL, 1977).

Further research is needed to determine the effect of continued mining activity on ranchers in the Sheridan-Decker area. West Decker would contribute to these effects at least through mine-life. If other mines open in the area, as proposed, the proportion of impact due to the West Decker mine would decline.

Understanding and forecasting impacts on society in coal development communities requires comparative study of these communities over time. This unfortunately has not been done.

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[3] This asumes no new town is developed in southeastern Montana. Development of a new town in the Decker area would decrease the reliance on Sheridan (DHES, December 1979). The effect of a new town on the geographic distribution of West Decker employees is not known.

I. ECONOMICS

1. Employment

Because employment at the mine has stabilized at 247 jobs, there would be very little additional ancillary growth. If the long-term secular changes of the past decade continue, there would be some minor additional growth, perhaps as many as 189 jobs (adapted from USDI and MDSL, 1979 (DES 79-41)) during the next 10 years.

The next 10 years should see total employment in Sheridan County grow by nearly 4,000 jobs to 16,301.[4] Almost all of the growth would be a result of the cumulative effects of coal mining.

Although the total number of workers at the West Decker mine should not change appreciably for the remainder of the mine life (assuming that the North Decker extension is permitted), women should make up a larger proportion of the mine's work force. Perhaps as many as 30 additional women could get jobs at the mine in the next 10 years as a result of the settlement of the recent discrimination suit brought against the company. (Staff analysis based upon statewide turnover rates, total mine employment and a 10-percent hire rate for women).

2. Income

The West Decker mine would continue to contribute substantial income to the Sheridan area.[5] Its relative contribution in Sheridan would decline slightly over the next 10 years from about 29 percent of the total to 22 percent of the total. The proportion would decline much faster if additional mines, notably mines on Young's Creek and Squirrel Creek, are developed.

The income effect in Montana will continue to result primarily from the relatively low tax rates that should prevail in the panhandle[a] and be localized in the same area (see taxation). West Decker's relative contribution to this tax effect would decline from more than 51 percent in 1980 to less than 24 percent in 1990, based upon its declining proportion of total production.

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[4] The total cumulative employment projections are based upon a scenario which includes only those mines which are in existence or have applied for permits. The "high scenario" assumed by Watts and others, 1978, projects increases of nearly 8,000 jobs by 1990. Neither scenario includes a synthetic fuel plant which could easily have an effect nearly equal to the cumulative impact of the area's projected mining.

[5] This assumes that a new town does not develop in southern Big Horn County and capture much of the influence of the mine.

3. Taxation

The approval of the Decker mine extension would not add significantly to Sheridan's fiscal problems. The mine would continue to provide significant revenues to the State, county, and school districts, although its proportion of total revenues would decline from about 42 percent to about 24 percent of total coal-generated tax revenues.

At the most recently reported contract sales price the West Decker mine would provide from $24 million to $38 million in taxable value to the county and school district in Montana, and from $16 million to $25 million per year in State revenues from the severance tax.

J. COMMUNITY SERVICES

1. Big Horn County

The extension of the West Decker mine is not expected to create any additional impact to community services in Big Horn County.

The exception to this would occur if a number of employees moved from Sheridan County to the proposed new town of Spring Creek. The availability and level of services in the town is uncertain; consequently it is difficult to project if and how many Decker employees might move from Sheridan to Big Horn County. The developers of Spring Creek project an eventual population of 3,000 to 4,000. West Decker currently employs 247 persons. (See Sociology and Economics, chapters II and III).

The impacts of the new town are described in the Department of Health and Environmental Sciences environmental statement: Proposed Spring Creek Subdivision, released December 18, 1979.

2. Sheridan County

No additional impacts, from that described in chapter II, are expected in Sheridan County from the extension of the West Decker mine.

If a number of employees were to move to the new town of Spring Creek, the stress on community services in Sheridan County would be reduced somewhat.

Cumulative impacts to community services in Sheridan and Big Horn County are described in the Northern Powder River Basin Coal regional analysis (USDI and MDSL, 1979).

K. LAND USE

Permitting the West Decker mine would probably not have a significant impact on land use. The entire permit area has been out of production since the area was permitted and fenced. As reclamation progresses, the minesite would gradually be returned to rangeland.

The actual postmining carrying capacity in AUM's is difficult to determine because capability is dependent on management as well as reclamation success (see Soils and Vegetation). The company began a grazing study in 1979 using a stocking rate of 0.4 AUM's per acre. It is too early, however, to determine the long-term results of this study.

The return of the area to wildlife habitat would take longer than its return to rangeland. This is because the habitat requirements for wildlife are much more diverse than those of livestock.

Postmining land use and success of reclamation are also dependent on topography and geormorphology (see those sections of chapters II and III). The value of the area as a watershed will be lowered until surface stability, vegetative canopy cover, and ground litter return to their premining condition.

Land use off the minesite would be negligibly affected by the extension of the West Decker mine. This is because the mine employees are already settled in the area, thus precluding the need to take additional land out of production for subdivisions or other forms of housing.

The exception to this would be if a substantial number of employees were to move to the new town of Spring Creek. West Decker employees, however, would probably not constitute over 10 percent of the town's projected population. The new town is proposed on a 311-acre site and would eventually contain 964 housing units (DHES, 1979). If the new town were successful, it would be a long-term impact (change) in land use.

L. TRANSPORTATION

The delay of vehicular traffic at trade crossings constitutes the major existing impact to highways in the region. Under the proposed mine extension analyzed herein, there would be no additional adverse impacts and no increase in the number of unit trains per day using the rail lines. As grade separations are constructed, there would be a decrease in impact.

Cumulatively, new coal trains from the Spring Creek mine and from the proposed Pearl and CX mines could add as much as 25 percent to the rail traffic as far east as Gilette.

A more detailed analysis of cumulative impacts from the existing and proposed mines in the area is presented in the Northern Powder River Basin Coal regional analysis (USDI and MDSL, 1979).

M. RECREATION

The proposed extension of the West Decker mine would not contribute any additional impact to recreational opportunities in the area.

Cumulative impacts on recreation, due to future coal development in the area, are described in the Northern Powder River Basin Coal regional analysis, volume I (USDI and MDSL, 1979 (DES 79-41)).

N. CULTURAL RESOURCES

There would be no adverse impacts to known cultural resources within the permit area. If the company did obtain short-term leases, no known sites would be disturbed.

Any sites discovered during mining would have to be mitigated. It is remotely possible that buried cultural sites could remain undiscovered. Any such sites would be destroyed by mining.

Cumulative impacts to cultural resources within the region are discussed in the Northern Powder River Basin Coal regional analysis (USDI and MDSL, 1979).

No historical sites have been identified within the West Decker mine area (Western Interpretive Services, 1973).

O. AESTHETICS

No additional significant impact to aesthetics would occur from the permitting of the West Decker extension. There would be the loss of a few outcrops and the final postmining topography would be more regular. Reduced visibility (air quality) due to the existing mining would not change.

CHAPTER IV

ALTERNATIVES TO THE PROPOSED ACTION

Administrative and technical alternatives are available to the regulatory agencies and the company in order to decrease and/or mitigate impacts due to the proposed plan. Because the company needs both State and Federal approval for the proposed mine and reclamation plan, Federal administrative alternatives are also included below.

A. ADMINISTRATIVE ALTERNATIVES

1. Defer the Decision

The State does not have a formal "deferral" alternative, however an application may be deemed incomplete due to failure of the mine and reclamation plan to meet requirements; this leads to a postponment of the action. The West Decker application is incomplete at this time.

The Secretary of Interior may defer the decision to accept or reject the proposed plan. The reasons for this include but are not limited to the need and time required for: (a) modification of the proposal to correct administrative or technological deficiencies; (b) modifications for the proposal in order to reduce or avoid environmental impacts; (c) aquisition of additional data to provide an improved basis for technical or environmental evaluation; or (d) further evaluation of the proposal and/or alternatives.

2. Prevent Further Development

Further development of this lease could be prevented if the Secretary sought and received authority from Congress to suspend operations, cancel the lease or aquire the lease. The Secretary can only suspend operations temporarily and cannot suspend operations to the extent that a de facto cancellation of the lease results. Similarly the Secretary can only cancel the lease on the grounds defined in the lease. Aquisition of the leases could be done only with Congressional authorization and with provison of funds for compensation to the lesses.

3. Approval with Modifications

The Commissioner or the Secretary may take various measures that tend to restrict development, in the interest of conservation of resources or in the protection of various specific environmental values in accordance with existing laws and regulations, such as the National Historic Preservation Act of 1966, the Endangered Species Act of 1973, and others. A number of mpacts identified in chapter III could be more fully mitigated by the implementation of one or more of the technical alternatives described below.

4. Permit Denial

The other major alternative open to the State is the denial or selective denial of the permit to mine in a specified area including areas of lands having special, unique, exceptional, or critical characteristics, or where mining would affect the use, enjoyment, or fundamental character of neighboring land having the above characteristics.

To the extent that coal production from the existing mine is curtailed or halted, alternative sources of energy would be required to meet the present needs and demands of the company's contract commitments. The existing physical, aesthetic, social, and economic impacts due to the existing mine would be reduced to a limited extent. Other mines proposed in the area could conceivably reduce the impacts of curtailing or halting production from the existing mine. However, there would be problems in trying to reconstruct both the topography and Pond Creek to stable configurations given the existing disturbance.

B. TECHNICAL ALTERNATIVES

Modifications such as changes in production rate, different mining procedures, changes in pit configuration, changes in the method of transport, or development of selected areas now under lease have been considered. It does not appear however, that these options would significantly alter the impact of extending mining at West Decker, and indeed, may of these options are not viable.

A change in production rate would change the rate at which these impacts occur but would not change the overall impacts. it would be impractical and wasteful to convert the mine to a truck and shovel operation from the existing dragline operation. The overburden to coal ratio also favors the use of a dragline. A change in configuration of the pit may result in the recovery of less coal, which under the Coal Conservation Act, is an unlikely alternative. As the rail transport system is already in existence, it would not be feasible to contruct a slurry pipeline for coal transport.

Other technical alternatives may be required as stipulations to a permit. Several alternatves mentioned are research needs rather than specific alternatives for reducing impacts. The information gained from such research could be used to reduce impacts at a later date.

1. Geology-Hydrology

The company's proposed postmining topography (figure I-8) has been designed to maximize the stability of the postmining drainages. Under this plan, steeper areas would be mined in order to provide extra spoil material for redesigning the drainages. The primary problem with this proposal is the creation of 3:1 highwall reduction slopes that are to be covered with topsoil. Severe erosion problems would probably develop (see chapter III, Geomorphology). Several alternatives are discussed below.

a. Avoiding the Uplands

One alternative would be to require the company to stop mining short of the steeper uplands, which is approximately what would occur if the company is unable to obtain the short-term BLM leases. Increased stability of the reduced highwall is the principal .benefit of this alternative. Slopes would be shorter and less material would be needed to reduce the final highwall. The aesthetics would also be increased because the natural steep upland bluffs would remain and would not be replaced by the long straight slopes proposed by the company.

The benefits of mining the steeper uplands may outweigh those associated with not mining them. The company's proposal to mine the uplands, which have a high overburden to coal ratio, allows about one-third of the final pit to be backfilled in the vicinity of Pond Creek. This additional spoil material is essential in reconstructing the small drainages along the highwall. If this additional material came from areas other than the uplands topsoil could not be direct-hauled and reclamation of mined areas may have to be substantially delayed because spoil material would have to be continually stockpiled until it could be used for backfilling the final pit. The delay of reclamation would probably not be acceptable to the Department because of the problems associated with stockpiling topsoil for long periods of time, the logistics of stockpiling both topsoil and spoil, and the increased surface area for wind erosion.

b. Mine Uplands, Decrease Slope of Reduced Highwall

A second alternative is to mine the uplands but to leave a highwall reduction slope of 5:1 or less. This solution would probably reduce the probability that the instability problems identified in chapter III would develop. If these slopes are to be topsoiled, it is strongly recommended that the highwall areas not be designed at slopes greater than 5:1.

The two drainages that flow along the base of the highwall (figure I-8) could be filled in more in order to decrease the slope angle of the reduced highwall. Fill material could be obtained from three areas: from an increase in the highwall reduction area, from the inner spoil ridges, or from areas where fill material could be mined (see alternative 5).

- Appreciably more area in the uplands would have to be disturbed to provide the extra fill necessary for 5:1 slopes. Because the western portion of the mine area steadily increases in elevation (figure I-4), it would be difficult to reduce the highwall to less than 5:1.
- More spoil material could be obtained from the inner spoil ridges. Reclamation of the interior areas, however, would have to be delayed and spoil material would have to be stockpiled (see aternative 1). The final topography of the interior would have to be flatter than is presently proposed (figure I-8).
- A third source of fill material would be to mine fill material without extracting coal (see alternative 5).

c. Steepen and Do Not Topsoil the Reduced Highwall

A primary problem with the company's proposal is the high probability that the topsoil placed on the proposed 3:1 slopes would would easily erode (see chapter III). The geomorphic instability of these slopes could be reduced if the highwall slopes were steepened and not topsoiled. The loose sodic spoils would be initially erosive, however, the regraded spoil and overburden, if left exposed, would tend to seal off, forming a pavement-like crust. The crust formed would be fairly competent and erosion resistant (Power, Sandoval, and Reis, 1978).

By not topsoiling the reduced highwall, more topsoil would be available for use elsewhere. Much of the natural steeper uplands lack any soil or vegetative cover at present, so not retopsoiling the reduced highwalls would approximate much of the existing landscape.

A variation of this alternative would be to increase the slope angle of the reduced highwall, possibly as steep as 1/2:1. This alternative not only better approximates the original contour of the uplands, but also decreases the area disturbed by mining. In addition, it would allow room for flat sediment-deposition areas between the base of the highwall and the drainages, thus keeping sediment out of the drainages. Although runoff would be fast over the comparatively small steeper areas, the crust formed on the untopsoiled overburden would still be fairly erosion resistent.

Infiltration of precipitation would be almost nil on the untopsoiled slopes. Vegetation, which is critically dependent upon moisture, would probably not grow here. The resultant landscape would resemble the naturally occurring badlands in the Decker area. Some of the existing uplands do have vegetative cover and therefore some productive areas would be irreversibly lost under this alternative. The area would not be useful for agriculture and wildlife.

d. Terraces or Contour Furrows

The proposed highwall reduction slope and topsoil could possibly be stablized with terraces or contour furrows for long enough to allow the vegetation to become established. The positive effect of terracing or furrowing is to reduce the length of the slope over which runoff can gain momentum. Dissipating the runoff energy would decrease the erosion of topsoil off these area. Also, dislodged sediment would be trapped in the flatter segments of these features.

Numerous adverse effects could develop. Increased infiltration of water could accentuate the movement of salts (see chapter III, Soils). Additionally, this approach to slope stabilization is difficult to design properly and may create a worse situation if it fails. The steeper segments of the terraces and furrows (greater than 3:1) would be more susceptible to erosion and less likely to revegetate. In addition, these features, in acting as impoundments, could fail, creating severe erosion problems. Terracing or furrowing would also give the reclaimed landscape an artificial appearance.

e. Mining Fill Material

A fifth alternative is to mine additional fill materials. Several areas at West Decker could be used to obtain fill. One such area is the ridge along the northwest limits of the mine (figure I-4 and I-8). This area would already be disturbed to some extent by both North and West Decker mining. By moving the disturbance further west and eliminating much of this ridge, additional material could be used to fill the final pit (see alternative 4). Additional coal could be extracted from this area, if disturbed, if additional BLM coal leases could be obtained. Another area where fill materail could be mined is the extreme southeastern corner of the mine (figure I-4). This area was not proposed for mining because the coal has been dowthrown by faulting to uneconomic depths. The mining of overburden in either of these two areas would increase the material available to fill in the pit and thereby decrease the slope of the reduced highwall (see alterantive 1 and 2).

The disadvantages of this alternative include the additional expense of mining fill, the increased disturbance to unmined areas and the removal of additional natural uplands.

2. Air Quality

A 30 percent reduction of particulate emissions from haul roads could be achieved by application of a sealant, coherex, or lignin sulfonate, for example. Dust emissions would also be substantially reduced during overburden removal by continuous minimization of the fall distance of the overburden material. Particulate and gaseous emissions along the highway corridor from Sheridan to Decker would be reduced if car-pooling were increased among the mine personnel.

3. Soils

The company will undertake to monitor sodium movement in the topsoil and assess the effectiveness of possible mitigating measures.

Specifically, permanent monitoring plots will be established on about every 10 acres of reclaimed land. This will allow the Company and the Department to detect any substantial upward movement of sodium before the soils are adversely affected.

Paired plots (treatment and control) will be established annually as newly regraded spoils are topsoiled. The treatment will involve the placement of calcium compounds (calcium chloride and calcium sulfate) in the surface 8 to 12 inches of graded spoils. This will reduce the influence of sodium in the overburden, at least temporarily. The effectiveness of these treatments over time will be evaluated.

Finally, the Company will continue monitoring the results of an on-site irrigation and calcium ammendment study begun in 1977 by Montana State University.

Should monitoring show that significant quantities of sodium are moving upwards into the topsoil, the Department would require additional mitigations. Such mitigations would be based, in part, on the results of ongoing studies at West Decker and elsewhere.

4. Vegetation

The seed mixture could be improved to include more species of shrubs, thus improving the quality of the postmining habitat for wildlife.

CHAPTER V

CONSULTATION AND COORDINATION

A. DEVELOPMENT OF THIS STATEMENT

This statement was written in response to application 00077, submitted by Decker Coal Company to the Montana Department of State Lands according to the Montana and National environmental policy acts. Because of duplicate Federal responsibilty this statement (EIS) may be adopted by the Office of Surface Mining (OSM) or that office may write another EIS or a suuplemental EIS for the Federal decision to permit or deny the application.

In preparation of this statement data and/or review comments have been solicited from the following organizations:

State and local agencies

- Big Horn County Health Department
- Department of Community Affairs
- Department of Health and Environmental Sciences:
  - Air Quality Bureau
  - Subdivision Bureau
- Department of Highways
- Department of Natural Resources and Conservation
  - Water Resources
- Montana Bureau of Mines and Geology
- Montana Historical Society:
  - State Historic Preservation Office
- Sheridan County Planning Office

Federal agencies

- U.S. Department of Interior:
  - Geological Survey, Denver, Colorado
  - Office of Surface Mining, Denver, Colorado

Applicant

Decker Coal Company

The following personnel from the Department of State Lands contributed to the preparation of this environmental statement. Other Department personnel reviewed the early drafts of this document.

Coefield, Thomas, Economist
-B.S. Economics, University of Montana, 1970

Contributors (continued)

Cornelius, Diana, Sociologist
- B.A. Economics/Sociology, University of Montana, 1979

Fuller, Beverly, Office Manager

Herrin, John, Geologist, Hydrologist
- B.S. Earth Science, California State University, Long Beach, 1974
- B.S. Geology, Northern Arizona University, 1976

Johnson, S. J., Coordinator
- B.A. Biology, Mount Holyoke College, 1973
- M.S. Candidate, University of Montana

Olsen, W. E., Air Quality Specialist
- B.A. Biology, State University College of New York, 1971
- Ph.D. Candidate, Botany, University of Montana, 1977

Swain, Walter C., Soils Specialist
- B.A. Geography, Beloit College, 1967
- M.S. Forest Soils, University of Washington, 1975

The Department appreciates the assistance of Judy Shamley and Dave Jennings, Decker Coal Company, who provided the team with information and arranged visits to the minesite.

B. REVIEW OF THIS STATEMENT

In accordance with the Montana Environmental Policy Act and the Departement's regulations governing environmental impact statements (EIS's), copies of this draft statement are available to the public for comments and suggestions. All comments received will be carefully considered in the preparation of a final EIS. Written comments should be addressed to the Department of State Lands, Capitol Station, Helena, Montana 59601.

The Draft EIS is available for review at the following places:

- Montana Department of State Lands, 1625 Eleventh Ave., Helena, Montana.
- Big Horn County Public Library, 419 North Custer Ave., Hardin, Montana.
- Miles City Public Library, 1 South Tenth, Miles City, Montana.
- Rosebud County Library, 201 North Ninth Ave., Forsyth, Montana.
- Parmley Billings Public Library, 510 North Broadway, Billings, Montana.

- Sheridan County Fulmer Public Library, 320 North Brooks, Sheridan, Wyoming.
- Bureau of Lnad Management (West of Miles City), P.O. Box 940, Miles City, Montana.
- The Office of Surface Mining, Brooks Towers, 1020 Fifteenth St., Denver, Colorado.

A limited number of copies are available on request from the Department of State Lands, Capitol Station, Helena, Montana, 59601.

CHAPTER VI

REFERENCES

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APPENDIX A

Emission factors associated with the West Decker mine

Page

TABLE VII-1.--Particulate emissions from the West Decker mine-- VII-2

TABLE VII-2.--Particulate emissions from the East Decker mine-- VII-4

TABLE VII-3.--Gaseous emissions caused by the Decker mining operations------------------------------ VII-6

TABLE VII-1.--Particulate emissions from the West Decker mine

Activity	Extent/year	Emission factor	Control Measures	Percent control[1]	Emissions (tons/yr.) Coal	Noncoal
Topsoil & Subsoil						
Removal------------	300,000 yd^3	0.38 lbs/yd^3	-	-		57.0
Replacement--------	300,000 yd^3	0.38 lbs/yd^3	-	-		57.0
Exposed areas--------	93 acres	3.02 tons/acre	Stabilization via revegetation within 1 growing season	75		70.2
Overburden drilling-	9,230 holes	1.5 lb/hole	-	-		6.9
Overburden blasting-	130 blasts	14.2-85.3 lb/blast	-	-		0.9-5.5
Overburden removal--	$12x10^6$ yd^3	0.0035-0.053 lb/yd^3	-	-		33.6-318
Coal drilling-------	20,280 holes	0.22 lb/hole	-	-	2.2	
Coal blasting-------	780 blasts	25.1-78 lb/blast	-	-	9.8-30.4	
Coal removal--------	$7x10^6$ tons	0.0035-0.014 lb/ton			12.2-49.0	
Haul road traffic---	124,290 miles	7.1 lb/umt	Water haul roads	50		[5]220.6
Coal dumping--------	$7x10^6$ tons	0.007-0.027 lb/ton	Water spray	50	12.2-47.2	
Coal screening------	$7x10^6$ tons	0.1 lb/ton	Completely	99	3.5	
Coal crushing:						
Primary-----------	$7x10^6$ tons	0.02 lb/ton	enclosed;	99	0.7	
Secondary---------	$7x10^6$ tons	0.06 lb/ton		99	2.1	
Conveyors & transfer			water			
points------------	$7x10^6$ tons	0.2 lb/ton	spray	100	0	
Coal storage--------	27,000 tons		Silos, filters	100		
Outdoor pile--------	12 acres	1.6_u lb/acre/hr u=1.8 m/sec	-	-	0 151	
Train loading-------	$7x10^6$ tons	0.0002 lb/ton	Retractable chute, hot oil spray	95 -[2]	0	
Deisel fuel---------	1,600,000 gal	27.3 $lb/10^3$ gal	-			21.8
Gasoline------------	126,000 gal	12 $lb/10^3$ gal	-			0.8
Unit trains---------	700					
Wyarno-Decker round trip (34 miles) distance traveled-	24,920	1.07 lb/mile	-	-[3]		13.3
Coal transported----	$7x10^6$ tons	?	Sprayed with hot oil 2 gallons/tons	?		
Mines associated population--------	750-1500 people	.06 tons/person	-	-[4]		45-90
			Total------------		194-286	527-861

[1] U.S. Environmental Protection Agency, 1979, Region VIII interim policy paper on the air quality review of surface mining operations.

[2] U.S. Environmental Protection Agency, 1976, Compilation of air pollution emission factors AP-42 Part B Second Edition: Research Triangle Park, North Carolina.

[3] URS, 1976 Coal train assessment: Final report.

[4] U.S. Environmental Protection Agency, 1973, National air monitoring program, air quality and emission trends: Annual report EPA 450/1-73-001.

[5] Includes only particles less than 30 microns in diameter which may be suspended indefinitely.

TABLE VII-2.--Particulate emissions from the East Decker mine

Activity	Extent/year	Emission factor	Control measures	Percent control[1]	Emissions (tons/yr.)	
					Coal	Noncoal
Topsoil & Subsoil						
Removal------------	563,400 yd^3	0.38 lbs/yd^3	-	-		107
Replacement--------	563,400 yd^3	0.38 lbs/yd^3	-	-		107
Exposed areas--------	80 acres	3.02 Tons/acre	Stabilization via revegetation within 1 growing season	75%		60.4
Overburden drilling-	18,000 holes	1.5 lb/hole		-		13.5
Overburden blasting-	253 blasts	14.2-85.3 lb/blast		-		1.8-10.8
Overburden removal--	18.7×10^6 yd^3	0.0035-0.053 lb/yd^3				52.4-495
Coal drilling-------	31,800 holes	0.22 lb/hole	-	-	3.5	
Coal blasting-------	750 blasts	25.1-78.1 lb/blast	-	-	9.4-29.3	
Coal removal--------	6.5×10^6 tons	0.0035-0.014 lb/ton	-	-	11.4-45.5	
Haul road traffic---	86,000 miles	7.1 lb/umt	Water haul roads	50%		[5]152
Coal dumping--------	6.5×10^6	0.007-0.027 lb/ton	Water spray	50%	11.4-43.8	
Coal screening------	6.5×10^6	0.1 lb/ton	Completely enclosed; water spray	99%		
Coal crushing						
Primary-----------	6.5×10^6	0.02 lb/ton		99%		
Secondary---------	6.5×10^6	0.06 lb/ton		99%		
Conveyor and transfer points---	6.5×10^6	0.2 lb/ton		100%		
Coal storage--------	60,000 tons		Silos, filters	100%		
Outdoor pile--------	7.3 acres	1.6 lb/acre/hr u=1.8 m/sec	-	-	92	
Train loading-------	6.5×10^6	0.0002 lb/ton	Retractable chute, hot oil spray	95% -[2]	0	
Diesel fuel------	1,300,000 gal	27.3 $lb/10^3$ gal	-			17.7
Gasoline------------	125,000 gal	12 $lb/10^3$ gal	-			0.8
Unit trains---------	620					
Wyarno-Decker round trip (36 miles) distance traveled-	22,320	1.07 lb/mile	-	-[3]		
Coal transported----	6.5×10^6 tons	?	Sprayed with hot oil 2 gal/ton	?		11.9
Mine associated population--------	1,000-2,100 people	.06 tons/person	-	-[4]		60-126
				Total----------	134-220	585-1,103

[1] U.S. Environmental Protection Agency, 1979, Region VIII interim policy paper on the air quality review of surface mining operations.

[2] U.S. Environmental Protection Agency, 1976, Compilation of air pollution emission factors AP-42 Part B Second Edition: Research Triangle Park, North Carolina.

[3] URS, 1976 Coal train assessment: Final report.

[4] U.S. Environmental Protection Agency, 1973, National air monitoring program, air quality and emission trends: Annual report EPA 450/1-73-001.

[5] Includes only particles less than 30 microns in diameter which may be suspended indefinitely.

TABLE VII-3.--Gaseous emissions (tons/year) caused by the Decker mining operations

Activity	Extent of activity/year West Decker	 East Decker	NO_x	SO_x	HC	CO	Alde-hydes	Organic Acids	HCN	Ref
Blasting (ANFO)[a]	3,935 tons	6,414 tons	16.6	-	-	220	-	-	0.56	1
Unit trains	24,920 miles	22,320 miles	375.0	57.9	95.4	132	5.67	7.09		2
Diesel fuel	1,600,000 gallons	1,300,000 gallons	607.0	45.2	61.2	142	14.0	-	-	3
Gasoline[b]	126,000 gallons	125,000 gallons	42.2	1.2	45.2	572	-	-	-	3
Mine associated population	750-1,500 people	1,000-2,100 people	298.0	122.0	228.0	595				4
Total			1,339.0	226.0	430.0	1,661	19.7	7.09	0.56	

[1] Chaiken, R.F., Cook, E.B., and Ruhe, T.C., 1974, Toxic fumes from explosives, Ammonium nitrate fuel oil mixtures, Report of Investigations 7967, Pittsburgh mining and safety research center: Pittsburgh, PA, U.S. Department of the Interior, Bureau of Mines, 24 p.

[2] URS, 1976 Coal train assessment: Final report.

[3] U.S. Environmental Protection Agency, 1976, Compilation of air pollution emission factors AP-42 Part B and suuplements, Second Edition: Research Triangle Park, North Carolina.

[4] U.S. Environmental Protection Agency, 1973, National air monitoring program, air quality and emission trends: Annual report EPA 450/1-73-001.

[a] Ammonium nitrate fuel mixture.

[b] Assume 12 miles/gallon.

DEPARTMENT OF STATE LANDS

THOMAS L. JUDGE, GOVERNOR
CAPITOL STATION

STATE OF MONTANA

(406) 449-2074
LEO BERRY, COMMISSIONER
1625 ELEVENTH AVENUE
HELENA, MONTANA 59601

June 10, 1980

To Reviewers of the West Decker Draft EIS:

On April 7, 1980, the Department of State Lands issued a draft environmental impact statement (EIS) on the proposed extension of the West Decker coal mine in southern Big Horn County, Montana. Three letters were received by the May 9 comment deadline. None of the comments in those letters requires major changes in the data or conclusions presented in the draft EIS; therefore, a final EIS will not be issued.

In accordance with the Department's regulations under the Montana Environmental Policy Act, copies of the comments and the Department's response are being sent to the Governor, the Environmental Quality Council, the Decker Coal Company, and the commentors. A copy is attached.

Sincerely,

Leo Berry, Jr.
Commissioner

STATE OF MONTANA

DEPARTMENT OF
FISH AND GAME

Helena, MT 59601
May 5, 1980

Mr. Brace Hayden
Department of State Lands
Capitol Station
Helena, MT 59601

RE: Draft EIS, West Decker Mine, Big Horn County, Montana

Dear Brace:

We have reviewed the West Decker DEIS and find it to be a satisfactory document. The cumulative effects of the ongoing and potential new strip mining in the Decker area present a bleak future for wildlife in the vicinity.

Thank you for the opportunity to review this document.

Sincerely,

Robert R. Martinka, Chief
Bureau of Baseline Studies

RRM/sd

cc: Keith Seaburg
Environmental Quality Council

BURLINGTON NORTHERN

LAW DEPARTMENT

176 East Fifth Street
St. Paul, Minnesota 55101
Telephone (612) 298-2121

May 8, 1980

MAY 12

Mr. Leo Berry, Jr.
Commissioner
Montana Department of State Lands
1625 Eleventh Avenue
Helena, Montana 59601

Dear Commissioner:

We have reviewed your draft environmental impact statement for the extension of Decker Coal Company's West Decker mine in Big Horn County, Montana. In examining this DES we noted that the locomotive emission factors contained in Tables VII-1, -2 and -3 are overstated by as much as 600% in some instances. Using current information provided to Burlington Northern by the manufacturer of the locomotives most commonly used in unit coal train service, we have recomputed these emissions factors. Table 1 attached outlines the computation methodology.

For Table VII-1 of the DES the emission factor for "Wyarno-Decker round trip (34 miles) distance traveled" should be 0.8 16/mile instead of 1.07 16/mile giving total emissions (tons/year) for noncoal of 10.0 instead of 13.3.

On Table VII-2 the "Wyarno-Decker round trip" emission factor would again be 0.8 16/mile in place of 1.07 16/mile for total emissions per year for noncoal of 8.9 tons (replacing 11.9 tons).

On Table VIII-3 *Gaseous Emissions (tons/year) caused by the Decker mining operations*, unit train emission would total as follows:

NO_x	387.4
SO_x	42.5
HC	14.2
CO	52.0
Aldehydes	4.2
Organic Acids	5.2

Sincerely,

Shirley A. Brantingham
Attorney

(retyped for clarity)

TABLE 1

LOCOMOTIVE EMISSION FACTORS

Pollutant	Emission Factor Lbs. Pollutant/ 10^3 Gal. Fuel Used	Emissions (3) Lbs. Pollutant Train Miles
Carbon Monoxide (CO)	68.5 (1)	2.2
Hydrocarbons (HC)	20.3 (1)	0.6
Particulates (TSP)	25.0 (2)	0.8
Nitrogen Oxides (NO_x as NO_2)	515.5 (1)	16.4
Sulfur Oxides (SO_x as SO_2)	57.0 (2)	1.8
Aldehydes (as HCHO)	5.5 (2)	0.18
Organic Acid	7.0 (2)	0.22

(1) Exhaust Emission Data. New Electro-Motive Division Locomotive Engines. GP40-2/SD40-2 Locomotive. Letter dated January 22, 1979.

(2) U.S. Environmental Protection Agency, Office of Air and Water Programs. Compilation of Air Pollutant Emission Factors, Third Edition, August 1977, EPA Bulletin AP-42. Table 3.2.2-1.

(3) Assumes $\frac{400\text{ Btu}}{\text{net ton mile}}$ *, $\frac{19750\text{ Btu}}{\text{lb. fuel}}$, $\frac{7.0\text{ lb. fuel}}{\text{gal. fuel}}$

$$\left(\frac{400\text{ Btu}}{\text{net ton mile}}\right)\left(\frac{110\text{ cars}}{\text{train}}\right)\left(\frac{100\text{ net tons}}{\text{car}}\right)\left(\frac{X\text{ lbs. pollutant}}{1000\text{ gal. fuel}}\right)$$

$$\left(\frac{\text{gal. fuel}}{7.0\text{ lbs. fuel}}\right)\left(\frac{\text{lb. fuel}}{19750\text{ Btu}}\right) = \frac{\text{Lbs. pollutant}}{\text{Train mile}}$$

* $\frac{400\text{ Btu}}{\text{net ton mile}}$ is from Office of Technology Assessment; 1978; A Technology Assessment of Coal Slurry Pipelines; Washington, D.C.; Volume II, Part 2, Page 205.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Billings Area Office
Federal Building, Room 3035
316 North 26th Street
Billings, Montana 59101

MAY 12 19

IN REPLY REFER TO:

ES

May 8, 1980

Mr. Leo Berry, Jr., Commissioner
Montana Department of State Lands
Capitol Station
1625 Eleventh Avenue
Helena, Montana 59601

Dear Mr. Berry:

We have reviewed the draft environmental statement on the Proposed Mining and Reclamation Plan for the West Decker Mine Extension, Big Horn County, Montana. We believe the statement adequately addresses impacts that will occur to wildlife resources as a result of the mine expansion.

We concur with conclusions reached in the draft statement that the reclamation mixture is deficient in shrub species that are necessary to return reclaimed areas to premining habitat conditions. Increasing the number of forb and shrub species, as mentioned in the Technical Alternative Section, would benefit wildlife and should be required before a permit to mine is granted. Use of a tree spade or container transplants should also be considered for re-establishment of ponderosa pine and juniper communities.

Thank you for the opportunity to review and comment on this draft environmental impact statement.

Sincerely,

Wally Steucke
Area Manager

cc: Regional Director, USFWS, Denver, CO (ENV)
ATTN: Frank Cole
Robert Martinka, Montana Department of Fish, Wildlife & Parks, Helena, MT
Regional Director, Office of Surface Mining, Reclamation & Enforcement, Denver, CO ATTN: Shirley Lindsey

RESPONSES TO COMMENTS

Letter from Montana Department of Fish and Game

No response necessary.

Letter from U.S. Fish and Wildlife Service

The Department has required the company to submit a map and plans for reestablishing shrubs and forbs. There is little pine and juniper on the mine site; to our knowledge, no important populations of wildlife depend on those trees.

Letter from Burlington Northern, Inc.

At the time the DEIS was written, the exhaust emission data from New Electro-Motive Division were not available. The methodology used by BN in the determination of emissions appears to be more precise than that used in the reference in the DEIS. The following corrections should be made in Appendix A.

TABLE VII-1

Unit Train	Emission Factor	Emissions Non-coal
	0.8 lb/mile	10.0

TABLE VII-2

Unit Train	Emission Factor	Emissions Non-coal
	0.8 lb/mile	8.9
		total 582-1100

TABLE VII-3

Units Trains	NO_x	SO_x	HC	CO	Aldehydes	Organic Acids
	387.4	42.5	14.2	52.0	4.2	5.2
Total	1351	211	349	1581	18.2	5.2

These revised emissions are lower than the predictions in the DEIS except for NO_x. The DEIS did not predict significant impacts from unit train emissions; therefore, the generally lower revised emissions would not change that conclusion.

500 copies of this publication were produced at a unit cost of $3.50 per copy, for a total cost of $1,750 which includes $1,000 for printing and $750 for distribution.

These printing and distribution costs were paid by Decker Coal Company, Inc., pursuant to Title 75, Chapter 1, Part 2 MCA.